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A TAXONOMIC REVISION OF THE AQUATIC BEETLE GENUS LACCOPHILUS (DYTISCIDAE) OF NORTH AMERICA

BY

JAMES R. ZIMMERMAN

PUBLISHED BY THE AMERICAN ENTOMOLOGICAL SOCIETY
AT THE ACADEMY OF NATURAL SCIENCES
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A TAXONOMIC REVISION OF THE AQUATIC BEETLE GENUS LACCOPHILUS (DYTISCIDAE) OF NORTH AMERICA[1]

BY

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INTRODUCTION

The aquatic beetle genus *Laccophilus* occurs on all continents except Antarctica — as well as on many nearby islands and island chains. Zimmermann (1920) included 167 species of *Laccophilus* in the world list. Of this number 27 are recorded from North America and the West Indies. Most of the remainder are in the tropics. Later lists (Leng 1920, 1927, 1933; Blackwelder 1939, 1944; Blackwelder and Blackwelder 1948) increase the total to 32. In North America there is a good representation of the genus, but not an extremely heavy concentration of species.

Several experienced workers in the Dytiscidae have commented on the difficulty in identifying and discriminating the species (Sharp 1882a, p. 287; F. Balfour-Browne 1940, p. 180; Leech 1948b; J. Omer-Cooper 1965). This problem may have been one important reason why no extended revision has been attempted in North America. The last revision (Crotch 1873) was not done in a modern sense, but was a summation of literature and descriptions of new

[1] This study was supported by NSF grants G17936 and G23585.

species. Several regional treatments were done in this century as part of faunal studies — Blatchley in Indiana and Florida (1910, 1919), Young in Florida (1954), Leech in Baja California (1948), Hatch in the Pacific Northwest (1953), and Anderson in Utah (1962). They were not intended to be revisionary; but all of them, especially Leech and Young, stress the need for such a study. It was evident that a revision of at least continental scope would be required to define species limits and for an understanding of the evolutionary divergence taking place in North American *Laccophilus*.

This study is a revision of the adults of North American species. Species with most of their ranges included in the Nearctic Realm are treated more thoroughly than primarily Neotropical ones which have extended their ranges into North America. West Indian species are generally omitted.

Determination of species limits requires studies of population variation. Some of the difficulties encountered by earlier workers were due to the lack of knowledge of the limits of variation. The difficulties in identification of *Laccophilus* species are minimal once that information is available.

Since a generic study also can provide information about the amount of differentiation in the formation of species, considerable attention was given to the recognition of races as well as species. In this respect there was close agreement in *Laccophilus* with the study of Burns (1964) on the skipper genus *Erynnis*. In his revision he states, "Locality data accumulated from accurately determined specimens show that much of the genus falls into complexes of geographically complementary forms. Each complex is broadly distributed in North America, and each is composed of entities that are both morphologically and biologically one another's near relatives. Some of these complexes may almost equally well be treated as polytypic species or as superspecies. Usually the choice is arbitrary and subjective, so that classification only reflects — imperfectly — the varying degrees of relationship that exist among the populations in nature."

Lumping of taxa has been the guideline in this study of *Laccophilus*. Allopatric groups previously considered species have been reduced to subspecies if it was felt there was enough similarity (obviously a subjective judgment). The same guideline applies to new forms described as subspecies. The presence of intermediates be-

tween two morphologically different and geographically replacing populations was considered to be evidence of intergradation; and the populations were thus given subspecific rank. If, however, there was a test of sympatry with a consistent difference and no intermediates, then specific rank had to be accorded, regardless of similarity. Some species are more similar in appearance than are some races within the same species (for example, *L. sonorensis, L. q. quadrilineatus,* and *L. q. tehuanensis*).

I wish to acknowledge the following individuals and museums for making material available for study: Patricia Vaurie, Jerome Rozen, American Museum of Natural History (AMNH); Floyd Werner, University of Arizona Museum of Entomology (ARI); J. Balfour-Browne, British Museum (Natural History) (BM); Jerry A. Powell, Paul Hurd, University of California, Berkeley (BERK); Richard Bohart, A. T. McClay, University of California, Davis (DAV); Ross H. Arnett, Eileen Van Tassell, Catholic University of America (CUA); George Wallace, Carnegie Museum (CNG); Henry Dietrich, Cornell University (CNL); James Sublette, Eastern New Mexico University; Rupert Wenzel, Field Museum of Natural History (FM); P. J. Darlington, Jr.; Harvard University Museum of Comparative Zoology (MCZ); Jean L. Laffoon, Iowa State College (ISU); G. Fogel, A. Capart, Institut Royal des Sciences Naturelles de Belgique, Brussels; Fred S. Truxal, Los Angeles County Museum (LACM); Guy Colas, Museum National d'Histoire Naturelle, Paris; Ronald B. Willson, Roland L. Fischer, Michigan State University (MCHS); John D. Lattin, Oregon State University (ORES); H. Radcliffe Roberts, Academy of Natural Sciences of Philadelphia (ANSP); Horace Burke, Joseph C. Shaffner, Texaxs A & M University (TAM); Russel D. Anderson (RDA); J. L. Carr (CARR); Burris McDaniels; Joe Schuh (SCH).

In addition, the following people have collected specimens for me: Robert D. Ohmart, Robert L. Smith, Kenneth L. McWilliams, and Robert N. Gennaro.

Georgianna Gunaji and William Doersam, National Science Foundation undergraduate research participants, also contributed directly to some of the information in this paper. Mr. Doersam measured most of the specimens of *L. pictus* and enumerated the locality records for that species. Mrs. Gunaji helped curate many specimens and assembled numerous locality records.

Mr. Anthony Smith has been especially helpful. He has collected hundreds of specimens and has written the computer program used in the analysis of the statistical data.

Finally, special thanks are due to Frank N. Young, Indiana University and University of Michigan Museum of Zoology (UMMZ), Hugh Leech, California Academy of Sciences (CAS), and Paul Spangler, United States National Museum (USNM), for the advice and encouragement as well as the specimens they have contributed during this study.

Materials and Methods

Collecting. — A large number of the specimens from Indiana, Kansas, and Oklahoma, the Southwest, and Mexico, were collected by the writer. Sweeping the water with a metal sieve or strainer was the most common method. An eight inch diameter wire strainer which can be found at the housewares section of grocery and hardware stores was modified and strengthened by replacing the handle with another heavier one on which was fitted a strong metal ring of approximately the same diameter. The commercial strainers have two projecting wire loops on the front that can be bent down over the heavy ring to help hold the wire sieve in place. The wire that formerly fit into the wooden or plastic handle that came with the strainer is inserted into the heavy wooden handle. A household strainer so modified will last several months or even years. The sieve can easily be replaced if the wires break. Short sweeps through water of a few inches depth, with the rim of the strainer just grazing the bottom of the pond or stream, yields the best results. Particular attention is given to grass, sedges, and other vegetation around the margins, and to debris or gravel on the bottom. Almost any freshwater habitat may harbor *Laccophilus*. Temporary roadside ditches, quarry pools, cattle tanks or ponds, small streams, margins of lakes, seepage areas, and sloughs have been successful collecting localities. Usually large river margins, riffles, water of more than one foot deep, and hot springs do not provide favorable habitat for the members of this genus. Young's (1954) statement about the distribution of water beetle populations is applicable at this point. "The actual factors which influence the maintenance of a population of water beetles are very numerous. The presence of food and pressure from predators are two important factors which vary

greatly with local conditions, and together with the need for replenishing the air in the tracheal system and a terrestrial situation for pupation, confine many species throughout their lives to a narrow shore-line strip. Water beetle populations are thus often not directly correlated with the volume of water, but with the extent of suitable shore line."

Once taken, each specimen is picked from the sieve with a feather-tip forceps and placed in a vial of 70 per cent ethanol and a few drops of glycerin. Vials were fitted with screw top plastic lids which had polyethylene cone liners to stop evaporation. Locality data included distance to nearest recognizable village, town, or city, and county (if in the United States), kind of habitat (stream, pond, roadside ditch), amount of emergent and submergent vegetation, nature of substrate, condition of water, surrounding plant life form, date, and collector(s). Elevation was frequently, but not always, included. There was an attempt to take all species of water beetles encountered, but naturally other genera would be less well represented in the collections.

Preparation and Examination. — Water beetles store fats and oils, and these can diffuse through breaks in the dried cuticle. Eventually a coating of grease covers most of the insects. The grease and the dust it collects obscure colors and structures. Hence, it is necessary to degrease specimens — both those recently collected and those that have been mounted for some time. The most successful method has been to soak them in ethyl ether. The insects are left in the ether until there is no increase in the yellow-orange color that results from dissolving the grease. This period may last from two hours to two days, but rarely longer. Once degreased, the specimens may be brushed clean with a fine brush dipped in 70 percent alcohol. Appendages are less brittle and less apt to break once the insects are cleaned. Insufficiently degreased specimens frequently come unglued from points.

Male genitalia must be extracted for examination. Fresh alcoholic specimens permit extraction with no further treatment, but dried ones must be softened. This can be done by gently boiling the beetles in water for a few minutes. Extraction is done under a binocular dissecting microscope by holding the insect with a pair of forceps (trial and error will show which kind is best) in one hand and grasping the aedeagus with sharpened watchmaker's forceps in the other. It is

better if the aedeagus and parameres are not detached from the insect; but, if they are, they can be glued to a paper point and then placed on the same pin as the insect. After drying, it is best to place the specimen into ether for an hour or two. Dry again before gluing on a point. Shellac has proven to be the best glue, but white glue and clear fingernail polish are also useful.

The ovipositor should also be exposed so that its form and number of teeth can be determined. This can be done easily on fresh or alcoholic specimens with much the same method used for male genitalia, but is usually more difficult in dried specimens that have been relaxed by boiling.

Descriptive characters. — Each species description is introduced by an assessment of general appearance which includes 1) size, 2) overall impression of color, 3) type of elytral pattern, 4) presence or absence of a metacoxal file, 5) length of prosternal process, and 6) form of the ovipositor.

1. Size is rated as small, medium, or large. Small insects are three to four millimeters long, medium ones are four to five millimeters, and large ones are over five millimeters. Each description has the extremes given for length and width.

2. The species are variously some degree of yellow, red, brown, black, and their combinations. Megascopically, irrorated species dorsally appear some shade of brown; but others have strongly contrasting patterns of reddish-brown and yellow, or black and yellow. The method of killing and preserving has altered the colors in many specimens; and this, along with the blending of colors, makes it difficult to give precise color descriptions. It is better, perhaps, to give more attention to whether a part of the exoskeleton is pale, usually some shade of yellow, or darkened by the admixture of other colors.

3. Elytral patterns provide the best diagnostic character in *Laccophilus* except for the male aedeagus. Patterns may be irrorated, unicolorous, suffused, marmorated or variegated. About twelve are of the first type in which the pigment has been applied as individual grains of sand. Each dot may be discreet or form a beadlike string, or the pigment may spread sufficiently to make a continuous pattern and thus appear suffused, marmorated, or variegated. The most common elytral color is some shade of brown, especially in the irrorated

species. Irroration is seldom uniform over the pattern, and there may be continuous color — particularly on the margins and in the posterior half of the elytra.

Although there is considerable individual variation in pattern, there is frequently enough uniformity in a race or species to permit positive identification of individuals regardless of sex, and in some instances to allow one to draw conclusions about the presence or absence of intergradation.

Elytral patterns help to break up the body outlines and in some cases, especially in irrorated species, provide concealing coloration. Irrorated species are extremely difficult to detect in water that has a mud bottom, or debris, or that has even the slightest degree of turbidity. Other species have strongly contrasting patterns (*L. pictus* and *L. horni,* for example), and these most commonly occur in mountain stream pools of the Southwest and Mexico which have clear water and granitic gravel bottoms. The bright yellow markings on a dark background make these animals virtually invisible until they move. Young (1960) discusses his observations and conclusions on the importance of color patterns in *Laccophilus* and other Southwestern and Mexican genera of water beetles. He believes the patterns have a strong selective advantage in the avoidance of predation.

4. An important secondary sexual character is the presence of a series of ridges on the metacoxal plates on males of some species (a much less well-developed file occurs on a few females). It is a stridulatory file that is rubbed by the upper surface of the hind femur. The number and coarseness of the ridges vary among species and among the races of species. A count is given for each species and race, but laterally the ridges often grade into the cuticular microreticulation and makes the number given only an estimate. It is considered an important diagnostic character, but the character may have arisen in different lines within the genus. The file is present in one race of *L. gentilis,* but absent or only faintly suggested in the other. It is a sound producing device that merits attention as the basis of a behavioral adaptation which operates as a sexual isolation mechanism.

5. The presence of an acuminate, unispinose prosternal process lying in the same plane as the prosternum is a generic feature of *Laccophilus.* Sharp (1882a), without trying to assign taxonomic rank, placed

a strong emphasis on the length of the process in his separation of species. He distinguished between those with a long or a short process. In the long one the process, and the groove on the metasternum which receives it, extend posteriorly to an imaginary line drawn across the hind margins of the mesocoxal cavities. Most North American *Laccophilus* have a short process, however, in which neither tip nor groove are that long. Some are intermediate and do not fit into either category as reflected in Sharp's descriptions (1882b) of *L. duplex* and its synonym, *L. optatus*. He described the first as having a process of moderate length and the second as having an elongate process. Since the position of the process is variable due to the flexing of the prothorax and since the length of the groove is sometimes difficult to assess even with the best stereoscope and lighting, it is not surprising that errors of interpretation result. It is probably one of the more important phylogenetic characters in the genus, however.

6. There are distinctly different forms of the ovipositor in North American *Laccophilus*. The first and most common type is one in which the teeth are small, triangular, and tightly spaced, or sawlike (fig. 42). It appears to be adapted for inserting eggs into tough tissues by means of a sawing action. The other less common type (rakelike) has the distal four or five teeth long and widespaced (fig. 188). It must be used for oviposition in softer and weaker material than the sawlike type. All species having the rakelike ovipositor are probably monophyletic since they share so many other characters, but those with a sawlike one appear to be composed of several different lineages.

Other characters. —

7. Microreticulation. F. Balfour-Browne (1940) maintains the only basic sculptures in the cuticle of the Dytiscidae (and other Hydradephaga) are reticulation and punctation. *Laccophilus* are covered with a fine network of roughly polygonal cells impressed into the surface. These cellules are frequently elongated on the metacoxal plates and epipleura. The most striking modification for taxonomic use, however, is that in some species a secondary mesh is formed by the weakening of the primary network forming the individual cellules. The tendency to form a stronger secondary network is termed "double" and the lack of that tendency is "single" — following the terminology of Young (1963). Balfour-Browne used elytra boiled in caustic

soda, permitting examination with transmitted light; but this is not necessary for *Laccophilus*. They can be observed with a magnification of 40 diameters or more in oblique reflected light if the specimen is thoroughly cleaned.

Elytral microreticulation varies most among species, but there is also some variation of the microreticulation on the head and pronotum. Males show the doubled condition more strongly than females. As a general rule those species with a rakelike ovipositor have a single condition, and species with a sawlike ovipositor have a double condition. Exceptions are *L. peregrinus* for the former and *L. biguttatus* for the latter.

Laccophilus species have almost no punctation on the elytra except for the usual two or three faint rows of setigerous punctures which seem common to all species with little noticeable variation.

8. Head. The head and its appendages are remarkably uniform in North American *Laccophilus,* but the antennae of *L. biguttatus* are slightly thickened when compared to other species. The only other variable feature is a row of elongate punctures (supraclypeal seam) that lie immediately above the clypeal margin. They may parallel the margin, or arch upward from it, or diverge upward at the sides.

9. Pronotum. Even though *Laccophilus* species have highly similar outlines, there is sufficient variation in shape and in the length of the pronotum to make comparison of ratios reflecting these differences worthwhile. Two values are given in each species description. The first is the width of the pronotum at the head, divided by the width of the pronotum at its base (WH/PW); and the second is the length of the pronotum from the head to the apex where it meets the elytral median suture, divided by the pronotal width (LP/PW).

The first value can be viewed in different ways. It shows a) how sharply the body converges anteriorly, or b) how wide the head is compared to the pronotum, or c) how ovate is the body. A high value (for example, 0.73 in *L. gentilis*) indicates a wider head and a more elongate body. Young (1954) notes that the narrow body form is characteristic of *gentilis,* and this rational value then is a reflection of that shape. On the other hand, *L. maculosus* has values of 0.66 to 0.68 and is obviously more ovate and more convergent anteriorly.

The second value reflects the acuteness of the angle formed by the

hind margin of the pronotum at the elytral median suture. The higher the value, the more acute is the angle (0.46 in *L. pictus insignis*); and a lower value indicates a more obtuse angle (0.38 in *L. horni*).

The variation in the two ratios has not been tested statistically, and the values given are approximate means. Even as approximations, they do give some indication of relationships. For example, *L. horni* and *L. leechi,* which are similar in many other ways, have identical values for both ratios. *L. pictus,* a species which is superficially similar to *L. horni,* is quite different in shape of the pronotum as revealed by the two values — suggesting less close relationship.

10. Epipleura. Considerable individual, racial, and specific variation exists among females in the shape of the elytral epipleura. In their unmodified condition as seen in males and many females, the epipleura are widest anteriorly and narrows in a smooth curve to little more than a thin line (fig. 2) at about the level of the first visible abdominal sternite. In many females, however, the narrow posterior section is expanded into a projecting lateral flange (figs. 276-278). Flanges may never occur in a species (*L. spangleri*), or may occur in nearly every female in some species (*L. fuscipennis*), or may be characteristic of nearly every female in one subspecies and be rare in its sister subspecies (*L. maculosus* and *L. fasciatus*). The degree of epipleural expansion varies among individuals of a population — from barely perceptible with 20 power magnification to easily observable megascopically (*L. maculosus shermani*). In contrast the position of the flange seems to be more characteristic of subspecies and species and is not an individual variation. The best example is the situation in *L. maculosus.* In *L. maculosus decipiens* the flange (on its rare occurrences) begins anteriorly at about the level of the mid-lateral elytral macula, and ends well before the elytral apical truncation (fig. 278). Females of *L. m. shermani,* on the other hand, have the flange beginning well behind the mid-lateral spot, and often it extends close to the apical truncation (fig. 277). The condition for intergrades appears to be intermediate.

Another modification of the female epipleura occurs in *L. quadrilineatus, L. sonorensis,* and *L. vacaensis.* In other species the median margin of the epipleura is an unbroken curve even in those females with flanges, but the females of these three species have an abrupt

break in the epipleural margin at about the level of the first abdominal sternite. There may or may not be a flange present.

It is difficult to assess the phylogenetic importance of the modifications of the female epipleura in North American *Laccophilus*. Since it is so obviously a highly variable sexual modification, it seems unlikely that it can be used to show relationships among species or species groups. Even races may differ significantly in the expression or even presence of the character. It is evident, however, that the modification in *L. quadrilineatus, L. sonorensis,* and *L. vacaensis* does represent more specialization than do the differences in size or position of the flange. One is inclined, therefore, to think that this character does support the view that those three species (and *L. inagua* Young of the Bahamas) should be placed together in any grouping of North American species.

11. Metasternum and postcoxal processes. There are some slight differences in the curvature of the suture between the metasternum and the metacoxal plate and in the shape of the postcoxal processes (fig. 2). The plate for each species has an outline drawing of the metasternum and the postcoxal processes. Comparable anatomical parts are all drawn to the same scale. The most obvious difference that results other than size can be seen in a comparison of *L. quadrilineatus* and *L. mistecus*. Although the distance from the hind margin of the mesocoxal cavities to the tips of the postcoxal processes is almost the same in the two species, the distance from mesocoxal margin to the posterior apex of the metasternum is greater in *mistecus* than in *quadrilineatus* (about 13 percent) — causing the internal lamina of the metacoxae to be relatively shorter in the former. Other species similarly can be compared.

There are also differences in the shape of the postcoxal processes. One extreme is seen in *L. maculosus* (fig. 2) in which the processes are strongly produced posterio-laterally, causing them to project well posterior to the midline. The other extreme is seen in *L. horni* (fig. 209) in which the processes are not at all produced; and the midline, or a point just off the midline, is the most posterior part.

12. Last visible abdominal sternite. Sharp (1882a, 1882b) frequently made use of the last ventral segment in his descriptions of *Laccophilus* species. It is generally a dimorphic character, but the degree of di-

morphism varies from almost none in *L. schwarzi* or *L. oscillator* to a large amount in *L. ovatus* or *L. spergatus*. Most males have an asymmetrical curving crest on the sternite, while females have one which symmetrically broadens and flattens anteriorly. Enough similarity exists among species so that this segment can be used in only a few diagnoses; but in such cases as the last two cited above, it can serve for positive identification without examination of the aedeagus. Sharp described three general types of ventral segments; a) entire without sinuation on either side of the middle, b) with sinuation, and c) truncated. In this paper type *a* would occur in *L. youngi* or *L. schwarzi* (figs. 236-237), type *b* in *L. pseudomexicanus* males (fig. 84), and type *c* in *L. spergatus* (figs. 100-101). While these types can be distinguished by description, it seems better to rely upon comparative drawings.

There is some phylogenetic significance in the expression of this character, but interpretation is difficult. Too often there is too much general similarity among species that are unrelated on other grounds. One exception is the case of *L. gentilis* and *L. ovatus,* and another is that of *L. mistecus* and *L. spergatus.* The last ventral sternite is strongly modified in both instances and strengthens other anatomical resemblances. *L. gentilis* and *L. ovatus* have spines along the lateral sternal margins — a feature that occurs in none of the other North American species. The spines, coupled with highly modified hind margins, do indicate affinity of the species to one another and their separation from the other species.

13. Legs. The first three segments of the male pro- and mesotarsi are enlarged in a dorsoventral plane, and in a lateral plane as well as in a few species. The degree of enlargement varies from easily seen to barely detectable at 20 power magnification. The segments are adorned with specialized hairs which are flattened distally into sucking discs, or palettes. There is a row of four palettes on each of the three segments. They function to help the male maintain purchase during copulation.

Each species description gives the length of the fifth segment expressed as so many times the length of the fourth. The fifth tarsal segment on the two front pair of legs is elongated in a few species — more than twice as long as the fourth. An interesting correlation

with this character is found in a modification of the female elytra. The length of the male fifth segment is approximately equal to the width of the anterior part of the female epipleuron. This means that, when he grasps the female, his claws hook around the ventral edge of the epipleuron and the tarsus bends at the seam between her epipleuron and elytron or between his fourth and fifth tarsal segments. His palettes then fit snugly against the dorsal surface of her elytron. The male fifth segment of *L. vacaensis* has elongated until it exceeds the width of the female epipleuron. To compensate, a crease (fig. 179) has developed above the epipleuron and now serves as the fulcrum for the flexing of the tarsi. The crease is also weakly present in a few other species.

Modification of the male tarsi is related to the nature of the microreticulation of the female elytra. The tarsi are most enlarged in the species in which the microreticulation is single and has a pebbled appearance (*L. vacaensis* and *L. quadrilineatus*). They are least modified in those species which have the microreticulation most clearly doubled and have smooth and shining elytra (*L. oscillator, L. schwarzi,* and *L. duplex*); and they are intermediate for others (*L. maculosus, L. proximus*).

Another character of limited taxonomic value is the nature and number of the spines or setae located on the proximal hind margin of the pro- and mesofemurs (fig. 2). The mesofemoral setae are normally longer and thicker than the profemoral ones. The usual number of setae is about six on each femur, but in a few species it may be as high as 12 on one or the other. The mesofemur usually has the higher number. There does not appear to be any consistent pattern to the exceptional numbers.

Attention was given to the hind legs, but I was generally unable to find reliable characters that showed differences among the species. An exception was *L. youngi.* This species has a greater difference in length between the inner bifid metatibial spine and the outer one than other species.

14. Male genitalia and oval plate. The structures include a) the aedeagus, or intromittent organ; b) a pair of lateral parameres; and c) a modified remnant of the ninth sternite, the oval plate (F. Balfour-Browne 1932). The aedeagus is the most useful diagnostic

structure in *Laccophilus*. It is usually an elongate tapered organ which bends about 30 to 60 degrees at near half its length, or curves gradually over its whole length. It may also be twisted or have protuberances somewhere along its length. When two aedeagi are compared side by side under the microscope, even slight differences in conformation can be detected. On the other hand, the parameres and oval plate, which may be equally sensitive diagnostic characters, are more difficult to compare among species. They are described and figured for each species, but they serve mainly to support conclusions based on the aedeagus.

Species show little variation in the aedeagus through ranges that cover hundreds or thousands of square miles. For example, males of *L. proximus* from Florida, Indiana, and Nebraska have essentially identical aedeagi even though some individuals may vary widely in size, color, and elytral pattern. *L. proximus* presently has no races recognized within it on the basis of differences in aedeagi or in other morphological characters. Other species with well-defined races (such as *L. maculosus* and *L. pictus*) have the same uniformity of structure within races. The shape of the aedeagus is distinctive and consistent in each race throughout the range, except for intermediates that occur in intergrade zones. Intergradation of the aedeagus adds more support to the weight given it in taxonomic determinations.

Certainly, one can find regional differences in aedeagi if enough time is spent and enough comparisons are made, but without discontinuity in structure no taxonomic distinction is necessary. Consider *L. mexicanus* with its three races. The only reliable difference between *L. m. mexicanus* and *L. m. atristernalis* is the slightly different tips of the aedeagi. As yet, their known ranges are narrowly allopatric in southern California with no intergraduation demonstrated; but, within the range of each, the aedeagus remains the same. Even slight differences in aedeagi can be indicative of sufficient change in genotype to warrant taxonomic recognition. The third race, *L. m. oaxacensis,* differs in several characters besides the aedeagus. It appears to be completely allopatric from *L. m. mexicanus* and could have been described a different species instead of just a race. I have preferred to retain it within *L. mexicanus*. The same reasoning applies for *L. gentilis, L. quadrilineatus,* and *L. peregrinus*.

It does not follow, however, that species separation will not result

without differences in aedeagi since reproductive isolation is the basis for determination of species limits and morphological differences merely serve to detect those limits. I am unable to distinguish between the aedeagi of *L. quadrilineatus* and *L. sonorensis,* and they normally would be considered a single species; but there is a qualitative difference between elytral patterns with no intermediates in a wide area of sympatry. Here other characters have precedence, and the populations are considered separate species. Polymorphism may be involved instead of reproductive isolation, but that has not been tested.

As yet I have not been able to see broad phylogenetic significance in comparisons of male genitalia.

Quantitative characters. — Four size measurements were used for statistical comparisons of populations. They are 1) total length, 2) elytral length, 3) total width, and 4) pronotal width. All can be taken from a dorsal view through an American Optical Cycloptic stereoscope fitted with either a 400 square grid or a reticle divided into 100 increments. Both were used on occasion. One grid square was equal to five increments and one increment was 0.054 mm at 20 power magnification. Measurements could be reliably interpolated to 0.5 increments.

Total length is the distance from the front of the head to the tip of the elytra. It does not include the tip of the abdomen which may or may not protrude. The measurement can be replicated if both endpoints are sharply in focus. Parallax error is reduced if the specimen is positioned horizontally instead of vertically in the field. Parted elytra, distended neck, and upturned head may contribute to inaccuracy. Normally the elytra should be joined, the head be drawn tightly into the pronotum, and the mouthparts facing ventrally for uniformity.

Elytral length is the distance along the elytral suture from the apex of the pronotum to the elytral tips. Parted elytra and parallax errors contribute most to mismeasurement. The elytral surface curves upward, causing trouble sometimes in distinguishing the exact intersection of the elytral suture and pronotal apex. The specimen must have the head and elytral tips on the same plane.

Total width is the greatest distance across the body and occurs just behind the midpoint. Frequent separation of the elytra gives this measurement limited use. The sample number is often less for many

localities, and the measurement is not included in a few cases. The value is more reliable for females than males, because the latter were manipulated more in curation. Teneral (recently emerged) specimens were omitted from the sample because of their shrunken condition.

The most reliable of the four quantitative characters is pronotal width. It is the greatest width across the base of the pronotum. It is little affected by distortion or disturbance of other body parts. Its endpoints are sharply defined and can be simultaneously adjusted into sharp focus.

A fifth character is also included in the tables. It is a ratio obtained by dividing pronotal width by elytral length. It is frequently a remarkably consistent character for different populations. Values are virtually the same to three decimal places.

Each species has a table which contains sample size, arithmetic mean, and standard deviation for all measurements from different localities. Also included are the rational means with their 95 percent confidence intervals. The locality should be interpreted as the center of the area from which the specimens were taken. The areas of geographical localities were restricted as much as possible, but some lumping from several localities appeared advisable in order to obtain larger samples. Decisions were necessarily arbitrary in those cases. I have not described any species or races merely from quantitative characters. More refined sampling and more experience in selecting characters is required for individual species problems.

Affinities and Distribution Patterns of North American Laccophilus

There are five or six separate phylogenetic groups within the 27 species of North American *Laccophilus*. Four of them, comprising 19 species, are relatively easily characterized; i.e. their members share a complex of characters and, at the same time, can be separated from other species. The other eight present a more confused situation, and it is not possible as yet to reliably draw boundaries for inclusion and exclusion.

The species groups on the North American continent appear to have several origins. The *maculosus* group seems to have originated and developed on this continent; *L. biguttatus* clearly has come from the Palearctic Region; the *gentilis* group are invaders from South

America; and the *vacaensis* group are, while tropical, not clearly of South or North American origin. At the same time *L. undatus* and *L. schwarzi* appear to be relict species of the temperate Northeastern deciduous forests, having close relatives only much farther to the south.

The *maculosus* group includes the largest number of species — nine, which are *L. maculosus, L. fasciatus, L. proximus, L. salvini, L. mexicanus, L. spergatus, L. mistecus, L. pseudomexicanus,* and *L. fuscipennis.* Most of them contain several well-differentiated races. The species cover wide geographical areas and are often extremely abundant. They are perhaps the most successful dytiscids in North America. All are irrorated species, but some may also have irregular black markings on the elytra. Five of the species have black on the venter, and the other four have venters that range from brownish-yellow to reddish-brown. Males have metacoxal files (some females also have traces), and the females have a fine saw-toothed ovipositor. Other characters are the strong dorsoventral enlargement of the male pro- and mesotarsi, the produced postcoxal lobes, and an intermediate condition of the elytral microreticulation; i.e., tending toward double. Although the species are exceedingly similar, male genitalia provide excellent characters for discrimination. Females of some species are so much alike, however, that considerable experience is necessary to distinguish among them; and, in some instances not even experience allows complete assurance.

The distribution of the *maculosus* group suggests an origin in North America. The largest concentration of species occurs on the Plateau and Central Highlands of Mexico. Eight of the nine species have been taken in this area. *L. fuscipennis* and *L. proximus* more typically are restricted to lowlands, but in the United States, *L. proximus* does commonly occur on the Great Plains at up to about five thousand feet. Routinely, four or five species of the *maculosus* group occur together in central Mexico. From this high concentration the number of sympatric species declines in a roughly concentric pattern to one species in the state of Washington, two in southern Baja California, two in Florida, two or three on the Yucatan Peninsula, and two in South America.

One might reason that there is more available habitat in the area of high frequency, but the large number of other *Laccophilus* species outside of highland central Mexico argues against that conclusion.

The high frequency seems to be more easily explained by assuming that central Mexico is the center of origin for the group and that they have spread out from that area.

Two other species with metacoxal files show some affinity for the *maculosus* group; but neither are irrorated and both have a more strongly double microreticulation and, consequently, are more shining. *L. pictus* is brightly colored with a strongly contrasting yellow and black pattern. Those characters, along with the differently shaped pronotum, argue against placing it in the *maculosus* group. The range of *L. pictus* is completely contained in North and Central America, however; and it might be a radically changed offshoot of the *maculosus* group. The second species, *L. youngi,* differs from the *maculosus* group only in its marmorated rather than irrorated pattern and microreticulation. It is clearly a Neotropical species and may provide a link between the *maculosus* group and species from the Andean highlands.

The next largest species group is the one which includes *L. vacaensis* and *L. quadrilineatus.* Other species included within this group are *L. spangleri, L. peregrinus, L. huastecus, L. raitti,* and *L. sonorensis.* The recognition of the existence in North America of this assemblage is one of the more surprising developments of this study. Formerly only *vacaensis* and *quadrilineatus* were known, and those were known only as monotypic species; but, in reality, the group is composed of at least seven species. Four of these contain two or three subspecies.

Two characters, both in the female, indicate the affinity of the members of this group. The first and most striking is the large toothed, rakelike ovipositor; and the second is the single condition of the elytral microreticulation which causes the females to be less shining and to have a somewhat velvety appearance. Other characters are the lack of a metacoxal file in the male and the strongly modified male pro- and mesotarsal segments. These segments are strikingly enlarged in a dorsoventral plane; but, in three species, there is also lateral expansion. The male aedeagi show less modification among the species than is seen in the *maculosus* group. Elytral patterns vary among irrorated and marmorated and some intermediate condition. *L. huastecus, L. peregrinus, L. raitti,* and *L. vacaensis* can be either and vary both racially and individually. *L. quadrilineatus* and *L. sonoren-*

sis are marmorated; and *L. spangleri* is irrorated, but with a strong tendency for fusion of the dots. Some individuals of *L. v. vacaensis* are superficially very close in their elytral pattern to *proximus* of the *maculosus* group (they are sympatric), but the males are easily separated between the two species.

The third group is of South American origin and contains but two species in North America. It is the *gentilis* group which contains *L. gentilis* and *L. ovatus*. *L. gentilis* has at least two races — one in the extreme southeastern United States and the other in all tropical lowland regions from Mexico to Panama and presumably beyond. It is also in the West Indies as *L. bifasciatus* Chevrolat and perhaps as some other species with which I am not acquainted. *L. ovatus,* which was described from South America, is racially different from its North American representative. The close relationship of *L. gentilis* and *L. ovatus* can be seen in several characters which, at the same time, show them to be distinct from other North American species. The most important is probably the long, acuminate prosternal process. Only these two species among the North American species have this condition. Another unique character is the presence of an irregular row of short spines or setae along the lateral margins of the last ventral abdominal segment. Both species tend to be more parallel-sided than other *Laccophilus*. In addition, both have shining elytral surfaces (microreticulation clearly double) which are generally brownish-red above with undulating yellow, subbasal bands and usually more yellow subapically. The genitalia are highly distinctive in contrast to the strong superficial resemblance of the two species. The ovipositor has fine sawteeth.

The presence or absence of a metacoxal file is not particularly important in this group. A file is present in one race of *L. gentilis,* but is absent in the other and in *L. ovatus*. This situation could readily be viewed as reinforcement or character displacement. In Mexico and Central America *L. ovatus* is sympatric with *L. gentilis suavis,* and the file is well-developed in the latter. But in Florida *L. g. gentilis* retains only a trace of it. *L. proximus* and *L. fasciatus,* filed members of the *maculosus* group, are the common species of *Laccophilus* in Florida. They also occur in Mexico with *gentilis* but not commonly in the same habitats.

The *gentilis* group represents a small North American extension of what appears to be a much larger group in South America which probably includes *L. latifrons* Sharp, *L. planodes* Guignot, and *L. curvifasciatus* Guignot among others.

L. biguttatus appears to be the single Palearctic representative that has successfully migrated to North America. It closely resembles *L. minutus* Linnaeus and could easily be considered a race of that species. *L. biguttatus* is the only boreal species of *Laccophilus,* a feature that agrees with the distribution of *L. minutus* in Eurasia. It has been able to extend its range into California via the Sierra Nevadas and into northwestern New Mexico via the Rocky Mountains. In spite of a wide distribution from coast to coast in northern North America, *L. biguttatus* has not undergone any marked racial differentiation, which supports the view that it is a recent immigrant.

The last six species of North American *Laccophilus* form a heterogenous assemblage which cannot easily be assigned to a single phylogenetic lineage or to one of the previous groupings. They do have characteristics which show some affinities among themselves. None are irrorated, but instead have pigment suffused over the elytra forming yellow spots or irregular, often interrupted bands surrounded by black, reddish brown, or some admixture of those colors. Metacoxal files are lacking, all have fine, sawtoothed ovipositors, the elytral surfaces are shining with strongly doubled microreticulation, and the prosternal process is either short or intermediate.

They separate into two distinct species pairs and two problematical species. The first contains *L. horni* and *L. leechi* which resemble one another so closely that one is inclined to consider them as races of a single species; but it is difficult to decide whether they are allopatric or sympatric, and they have accordingly been retained as separate species. Their most outstanding features are the brightly spotted yellow and black elytral patterns, the prominent pigmentation on the pronotum, and the truncated postcoxal processes. They show no particular relationship to any one of the other four species, however. Their range is largely confined to Mexico north of the Isthmus of Tehuantepec, and to the southwestern United States. *L. leechi* is the more restricted of the two and has been found only in two locations in the lower mountains on the West Coast of Mexico.

L. oscillator and *L. duplex* are another species pair that are very

similar to one another, but sympatry has been established. The elytral pattern is the suffused type with an irregular undulating subbasal band and an incomplete postmedian one. *L. oscillator* has a short prosternal process; and *L. duplex* has an intermediate one, but not nearly as long as that of *L. gentilis*. *L. schwarzi* also has an intermediate length prosternal process, the same general type of elytral pattern, and an aedeagus similar to *L. oscillator* and *L. duplex* so that it may be related to those two species. They are tropical species which extend only as far north as Nuevo Leon and Tamaulipas (*L. duplex*) and Arizona (*L. oscillator*). Both apparently extend into South America and the West Indies. *L. schwarzi* has been collected only in the vicinity of Washington, D. C., and Amherst County, Virginia. It could be a relict of a population that formerly extended much farther south. *L. schwarzi* may in turn be close to *L. undatus,* but no characters place it closer to *L. undatus* than to *L. duplex* (in fact, the reverse is true). *L. undatus* is confined to the northeastern hardwood deciduous forest belt. It is a unique species that cannot be closely allied with any other North American *Laccophilus* and surely must be a relict. It would not be too surprising to find it has a close relative in the temperate Andean highlands.

L. undatus, L. schwarzi, L. duplex, L. oscillator, L. horni, and *L. leechi* do share one common ecological relationship that separates them from other North American *Laccophilus*. Instead of preferring small aquatic habitats in sun-exposed environments, they all prefer shaded habitats and, more often than not, pools or streams rather than ponds or ditches. This could represent the beginning of a gradistic change that may be more significant than any presently detectable morphological difference that sets them off from other *Laccophilus*.

Summary. — Construction of a phylogenetic tree of North American *Laccophilus* would be premature at this time. It will be necessary to have a broader view of the total diversity within the genus and more reliable criteria for which are primitive or derived characters within the genus. Only one character seems to be a fairly good indicator of specialization in the North American species — the wide-toothed rake-like ovipositor of the *vacaensis* group. Other shared characters seem to be just as attributable to parallelism or convergence as to affinity. It will probably require studies of internal anatomy, cytology, and

immature stages — as well as external morphology — to arrive at reliable criteria for primitive and advanced characters.

Nearly all members of *Laccophilus* appear superficially similar due mainly to their streamlined shape; but there can be no doubt that there has been considerable divergence in them, as the North American species demonstrate. They are a highly successful group, and some species are perhaps expanding their ranges and also undergoing a vigorous speciation. The species of North America derive from several sources: 1) The Old World (*L. biguttatus*), 2) South America (the *gentilis* and *oscillator* groups), and 3) North America (the *maculosus* group). The *vacaensis* group are morphologically the most homogenous and could be considered as subgenerically differentiated, but this should not be done until the South American species are better known. The *horni-oscillator* group, although not morphologically distinctive or even homogeneous, have diverged ecologically toward a different type of aquatic habitat.

Most *Laccophilus* species are wide-ranging, outbreeding forms which can survive in a variety of aquatic habitats; and an understanding of North American *Laccophilus* is only possible after the South American and West Indian species are better known.

Genus LACCOPHILUS Leach

Laccophilus Leach, 1817, p. 69; Type species: *Dytiscus minutus* Linnaeus, 1758 (= *Dytiscus obscurus* Panzer, 1794); fixed by Westwood, 1838.

DIAGNOSIS. — The North American members of this genus are small (3.0 mm to 7.0 mm), streamlined, shining insects that are most easily recognized among the dytiscids by the produced lobes on the hind margins of the metatarsal segments (fig. 1). The closely related, but much rarer genus, *Laccodytes,* has produced lobes also, but it differs in having simple, instead of bifid, metatibial spines, and the largest *Laccodytes* probably never exceeds 2.5 mm. The head of *Laccophilus* appears extremely short when viewed from above due to the generally hypognathous attitude. The head, pronotum, and elytra form a continuous outline; and the tip of the prosternal process is unispinose. The males of about a third of the species have a series of short ridges (metacoxal file) on the metacoxal plates. An excellent field character is the manner in which they jump when captured in a sieve. They are able to hop a distance of one or two inches when attempting to right themselves. Large dytiscids, such as *Dytiscus* and *Cybister,* will do the same thing; but few, if any, of the small ones do.

DESCRIPTION. — *General appearance*: small (3.0 to 7.0 mm), oval, shin-

ing; head, pronotum, and elytra with continuous streamlined outline; widest at about or just behind the middle; colors ranging from black and brown to red and yellow and mixtures thereof. *Head*: hypognathous, extremely short in dorsal view; incomplete line of punctures just above the clypeal margin. *Pronotum*: posteriolateral angle rectangular or obtuse; not margined. *Elytra*: scutellum hidden; elytra varying from slightly truncated to slightly attenuated; some females with a flange flaring laterally from the posterior part of the epipleura; posteriolateral margins fringed with long posteriorly directed hairs. *Microreticulation*: fine polygonal mesh over dorsal surface; secondary mesh sometimes formed due to weakening of smaller inner cellules; coarser in females; cellules frequently elongate, especially on venter. *Venter*: prosternal process with ventral crest, widened in apical third posterior to procoxae; expanded part varies from diamond-shaped to strongly acuminate; episternum of metathorax does not reach the mesocoxal cavity; metasternal wings very slender, arcuate; males of some species with a metacoxal file — a series of ridges curving posteriorly and laterally away from the midline; postcoxal processes varying from slightly rounded and produced to truncated; last ventral abdominal segment may be rounded, truncated, or notched; oblique striations on all abdominal segments; setigerous punctures scattered over surface of last segment, usually thickened toward hind margin. *Legs*: first three segments of pro- and mesotarsi of males enlarged in at least a dorsal-ventral plane and fitted with a series of rows of sucking discs; claws simple and equal on front two pair of legs, unequal on metatarsi; antennal comb on ventral margin of profemur; conspicuous setae on basal ventral margin of pro- and mesofemora; metatarsi with produced lobes on hind margins; metatibial spurs bifid, unequal; two or three large spines located on metatarsal posterior margins. *Genitalia*: aedeagus sclerotized, at least twice as long as either paramere; right paramere more strongly sclerotized than left, roughly triangular, and with one or two hairs projecting from near apex; left paramere usually larger than right, heavily sclerotized at base, but more flexible and flattened apically; apex rounded with one or two hairs; oval plate with median ventral ridge and usually an acuminate tip; ovipositor toothed ventrally, strongly sclerotized.

Checklist of the Laccophilus of North America

1. *maculosus*

m. maculosus Say (= *maculosus* Germar)	new synonymy and status
m. decipiens LeConte	new status
m. shermani Leech	new status

2. *fasciatus*

f. fasciatus Aubé (= *apicalis* Sharp)	new synonymy and status
f. rufus Melsheimer (= *fasciatus* Aubé)	restored name, new status
f. terminalis Sharp	new status

3.	*proximus*	
	p. proximus Say	new status
	p. americanus Aubé	new status
4.	*salvini* Sharp	
5.	*mexicanus*	
	m. mexicanus Aubé	new status
	m. atristernalis Crotch	new status
	m. oaxacensis	new subspecies
6.	*pseudomexicanus*	new species
7.	*mistecus*	
	m. mistecus Sharp	new status
	m. aztecus	new subspecies
8.	*spergatus* Sharp	
9.	*fuscipennis* Sharp	
10.	*youngi*	new species
11.	*pictus*	
	p. pictus Castelnau	new status
	p. coccinelloides Régimbart	new status
	p. insignis Sharp	new status
12.	*vacaensis*	
	v. vacaensis Young	new status
	v. chihuahuae	new subspecies
	v. thermophilus	new subspecies
13.	*spangleri*	new species
14.	*peregrinus*	new species
	p. peregrinus	new subspecies
	p. variabilis	new subspecies
15.	*huastecus*	new species
16.	*raitti*	new species
17.	*quadrilineatus*	
	q. quadrilineatus Horn	new status
	q. tehuanensis	new subspecies
	q. mayae	new subspecies
18.	*sonorensis*	new species
19.	*biguttatus* Kirby	
20.	*horni* Van den Branden	
21.	*leechi*	new species

22.	*undatus* Aubé	
23.	*schwarzi* Fall	
24.	*duplex* Sharp (= *optatus* Sharp)	new synonymy
25.	*oscillator*	
	o. oscillator Sharp	new status
	o. laevipennis Sharp	new status
26.	*gentilis*	
	g. gentilis LeConte	new status
	g. suavis Sharp (= *championi* Sharp)	new synonymy and status
27.	*ovatus zapotecus*	new subspecies

Key to the Laccophilus of North America North of Panama and Exclusive of the West Indies

1. Elytra with irrorations (color applied as grains of sand) 2
   Elytra without irrorations 14
2. Males with metacoxal file (fig. 2); females with sawlike ovipositor (fig. 42) 3
   Males without file; females with rakelike ovipositor (fig. 188) 10
3. Venter with black or nearly black (best viewed megascopically) 4
   Venter with various shades of yellow, red, or brown 5
4. Elytra evenly irrorated; last ventral segment of males strongly truncated (fig. 100); that of females slightly truncated (caution: do not confuse translucent spots as concentrations of color) ..... *spergatus*
   Elytra unevenly irrorated (see table below). All of these and *spergatus* are easily separated from one another by the male aedeagus but are superficially extremely similar ..... *salvini, mexicanus, pseudomexicanus, mistecus*
5. Elytra tending to form an irregular black fascia across its posterior half (extends anteriorly also in *f. fasciatus*), sometimes appearing checkered when viewed megascopically ..... *fasciatus*
   Elytra without fascia 6
6. Three or four large, well-defined maculae along the lateral margins of the elytra ..... *maculosus*
   Lateral maculae not well-defined 7
7. Under 6 mm 8
   Over 6 mm ..... *mistecus aztecus*
8. Coastal regions of California and Oregon ..... *mexicanus atristernalis*
   Not occurring in California and Oregon 9
9. Elytral pattern with limits easily distinguished in anterior half; males with strongly developed file and female with weak one; broadly distributed east of Rocky Mountains and east coastal lowlands of Mexico ..... *proximus*

Table for separation of *Laccophilus salvini, L. mexicanus, L. pseudomexicanus,* and *L. mistecus.*

		average length (mm)	male tarsal enlargement	last ventral segment	elytral pattern	LP/PW	Range
salvini		4.2 4.4	d-v	rounded, even	tends to form obscure fascia	0.40	Arizona (rarely) to Guatemala
mexicanus			d-v	rounded, even	rather even with considerable suffusion between dots	0.40 0.41	
atristernalis		4.7	.....	.....	.....	.....	Oregon, Idaho, Utah, California, Nevada
mexicanus		4.8	.....	.....	.....	.....	Baja California, California, to Colorado to Puebla
oaxacensis		5.0	.....	.....	.....	.....	Oaxaca
pseudomexicanus	♂ ♀	5.3 5.1	d-v and laterally	weakly truncate in male; not at all in female	even, but dark	0.43	Sierra Madre Oriental, S. M. Occidental, Mexican Central Highlands
mistecus (part)	♂	6.0	d-v	truncate	usually two noticeable spots in disc of elytra	0.40	Oaxaca

Pattern limits not easily determined; file weak in male; Mexican lowlands ..... *fuscipennis*

10. Front of head darkened; irroration indistinct at best ..... *huastecus*
    Occiput, but not front of head sometimes darkened; irroration strong or weak 11
11. Irroration indistinct at best; complete suffusion of color in many specimens 12
    Irroration distinct on most of elytral pattern 13
12. Well-defined crest above epipleural seam in females (fig. 179); length 4.8 to 5.2 mm; San Blas, Nayarit ..... *raitti*
    Poorly defined crest above epipleural seam in females (fig. 172); length 3.8 to 4.3 mm; Neotropical Mexico ..... *peregrinus peregrinus*
13. Male with fifth pro- and mesotarsal segments two and one-half to three times as long as fourth; female epipleuron abruptly narrowing just behind level of hind coxal cavities and frequently with flange (fig. 277); length 4.3 to 4.9 mm; southern United States to Panama and West Indies ..... *vacaensis*
    Male fifth pro- and mesotarsal segments no more than twice as long as fourth; female epipleura narrowing gradually (fig. 2); rarely, if ever with flange; length 3.9 to 4.8 mm; Veracruz to Nicaragua ..... *spangleri*
14. Elytra uniformly brownish-yellow or light brown; apical segments of antennae and palpi darkened; length 3.9 to 4.8 mm; Canada, and high mountain areas of the northern United States ..... *biguttatus*
    Not as above (antennae and palpi of *undatus* darkened) 15
15. Prosternal process long; i.e., groove on mesosternum which receives process extends well posterior to mesocoxal cavities (fig. 261); lateral margins of last ventral segment with irregular row of short spines or setae 16
    Prosternal process short; no spines present on lateral margins of last ventral segment 17
16. Male without metacoxal file if occurring in the United States, but with file in Latin America; apex of last ventral segment not produced; reddish-brown elytral color evenly applied; length 3.0 to 3.5 mm; Gulf Coast, Sonora to Panama ..... *gentilis*
    File absent; last ventral segment truncated and with produced apex (figs. 270-271); elytra uneven and frothy; reddish-brown color; length 3.3 to 3.8 mm; Veracruz and Yucatan to South America ..... *ovatus*
17. Elytra strikingly marked with yellow spots on zigzag stripes surrounded by black or cordovan black 18
    Not as above 20
18. Postcoxal processes laterally produced (fig. 2); male with file; metacoxal plates entirely pale; epipleura strongly darkened in anterior half; length 4.5 to 6.0 mm; southwestern United States, Baja California, Mexico to Costa Rica ..... *pictus*

Postcoxal processes truncated (fig. 209); no file in males; metacoxal plates darkened at least on lateral margins; epipleura weakly darkened at most 19

19. Dark pronotal markings on front and base confluent across disc; length 3.5 to 3.8 mm; Nayarit and Jalisco ..... *leechi*

Pronotal markings not confluent across disc; basal one suggestive of handlebar moustache; length 4.2 to 4.8 mm; Arizona and Texas to Oaxaca .... *horni*

20. Occurring in eastern United States 21

Not extending east of Texas and north of Kansas in United States 22

21. Tips of maxillary palpi and antennae darkened; brown, yellow, and black variegated elytral pattern; lateral margin of metacoxal plates not darkened; length 3.2 to 4.3 mm; northeastern United States ..... *undatus*

Palpi and antennae not darkened; lateral margin of metacoxal plate darkened; elytra brownish-red with incomplete subbasal band; Washington, D. C. and Virginia ..... *schwarzi*

22. Front of head darkened; length 3.9 to 4.2 mm; Veracruz ..... *huastecus*

Front of head not darkened 23

23. Elytra with irregular subbasal band; surface highly shining; postcoxal processes truncated (fig. 209). (Note: male genitalia must be examined to satisfactorily separate following species) 24

Elytra marmorated or variegated, but without subbasal bands; surface microreticulation single; postcoxal processes laterally produced (fig. 2) 25

24. Darkening of pronotum extending from base to disc; sternites usually darkened; length 4.1 to 5.8 mm; Arizona to Panama ..... *oscillator*

Darkening confined to base and not attaining discal region of pronotum; sternites pale; length 3.5 to 4.1 mm; Tamaulipas to Costa Rica .... *duplex*

25. Male with metacoxal file; female with sawlike ovipositor (fig. 42); length 4.6 to 5.4 mm; Nayarit to Costa Rica ..... *youngi*

No metacoxal file; rakelike ovipositor (fig. 188) 26

26. Pro- and mesofemoral setae (fig. 2) at least twice as long as femur is wide (species usually exceeding 5.0 mm) 27

Pro- and mesofemoral setae less than twice as long as femur is wide (species usually less than 5.0 mm) 28

27. Marmorated elytral pattern covering most of elytra (Yucatan) or with four relatively solid colored prominent anterior extensions from a postmedian blotch; length 5.0 to 6.7 mm; Kansas to California south to Isthmus of Tehuantepec and Yucatan Peninsula ..... *quadrilineatus*

Elytra with four open anterior extensions from a postmedian blotch (fig. 306); length 5.0 to 6.0 mm; southwestern New Mexico to south California, Sonora and Baja California ..... *sonorensis*

28. Length 4.8 to 5.2 mm; females with well-defined crest above epipleural seam (fig. 179); known only from Nayarit ..... *raitti*

Length 3.8 to 4.6 mm; poorly defined crest above epipleural seam in females (fig. 172); usually occurring south of Isthmus of Tehuantepec ..... *peregrinus* (part)

LACCOPHILUS MACULOSUS

The three well-defined races in this widespread polytypic species were previously considered species. *Laccophilus* was described by Say in 1823 from the eastern United States (presumably from Indiana); *L. decipiens* by LeConte in 1852 from California; and *L. shermani* by Leech in 1944 from Arizona and Texas. Their present ranges and intergrade zones suggest that they were geographical isolates during the last glaciation. After the ice sheet retreated, secondary contact occurred in the northern Great Plains between *maculosus* and *decipiens*. A similar contact between *decipiens* and *shermani* took place in northern Arizona and New Mexico as the forests' lower margins retreated to higher elevations. Today *maculosus* is most concentrated and abundant in the glaciated region of the northeastern deciduous forest. It is replaced by *decipiens* in the western United States, southern Canada, and Alaska. This race in turn intergrades in a narrow band with *shermani,* the southwestern and Mexican replacement.

L. m. maculosus is smaller and more strikingly patterned than the other two races, which superficially are extremely similar. It also has less size difference between the sexes than is found in *decipiens* and *shermani*. However, *shermani* shows divergence in secondary sexual characters (metacoxal file, epipleural flange, and aedeagus) from *decipiens* and *maculosus* which have diverged relatively little in those characters.

Apparently, there is sufficient ecological separation so that intergrades can be successful only in narrow, intermediate zones. There is no evidence of swamping. The intergrade populations manifest enough heterogeneity in all characters to suggest some backcrossing and F_2's.

DESCRIPTION. — Large (length 5.0 to 6.4 mm; width 2.3 to 3.3 mm), brown, irrorated species; metacoxal file present, prosternal process short, ovipositor sawlike. COLOR. *Head*: pale brownish-yellow above and beneath; faintly darkened with reddish-brown at the base of the pronotum; appendages pale yellow except mandibles that darken to brownish-red toward tip. *Pronotum*: pale brownish-yellow with reddish tint. *Elytra*: dark brown irrorations on a pale brownish-yellow background; prominent pale spots present (figs. 1, 281); irrorations often in strings and tending to coalesce around maculae; epipleura pale yellow anteriorly and sometimes with reddish-brown posteriorly.

Table 1. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus maculosus*.

Locality		N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
Laccophilus m. maculosus									
New England	♂	81	5.42 0.173	4.23 0.143	(68)	3.12 0.101	2.48 0.077	0.587	0.0032
	♀	74	5.33 0.164	4.16 0.149	(61)	3.07 0.110	2.42 0.086	0.583	0.0058
Allegheny Co., Pennsylvania	♂	47	5.37 0.167	4.15 0.146	(44)	3.10 0.111	2.48 0.083	0.583	0.0030
	♀	48	5.23 0.242	4.14 0.193	(46)	3.03 0.142	2.40 0.109	0.580	0.0032
Ohio	♂	21	5.30 0.149	4.16 0.124	....	....	2.48 0.052	0.596	0.0080
	♀	27	5.35 0.142	4.16 0.110	....	....	2.43 0.067	0.583	0.0051
Southern Michigan	♂	47	5.30 0.162	4.09 0.119	....	....	2.45 0.100	0.599	0.0034
	♀	44	5.18 0.165	3.99 0.138	....	....	2.37 0.095	0.593	0.0060
Upper Peninsula, Michigan	♂	58	5.42 0.148	4.19 0.094	....	....	2.51 0.060	0.600	0.0034
	♀	57	5.30 0.146	4.11 0.58	....	....	2.46 0.058	0.599	0.0030
Douglas Co., Kansas	♂	19	5.38 0.194	4.16 0.154	....	....	2.45 0.092	0.588	0.0051
	♀	20	5.21 0.188	4.06 0.140	....	....	2.37 0.097	0.583	0.0088
Laccophilus m. decipiens									
Wyoming	♂	11	5.66 0.167	4.37 0.098	(8)	3.24 0.087	2.61 0.075	0.598	0.0065
	♀	15	5.55 0.172	4.28 0.139	(12)	3.24 0.126	2.59 0.090	0.604	0.0045
Denver Co., Colorado	♂	13	5.72 0.215	4.38 0.118	(9)	3.29 0.093	2.68 0.081	0.613	0.0040
	♀	18	5.61 0.129	4.26 0.103	(6)	3.31 0.126	2.63 0.066	0.618	0.0051
Sagauche Co., Colorado	♂	29	5.78 0.139	4.52 0.091	(20)	3.39 0.063	2.74 0.064	0.606	0.0045
	♀	15	5.62 0.256	4.36 0.158	....	3.33 0.155	2.65 0.122	0.608	0.0078
Washington Co., Utah	♂	10	5.76 0.210	4.32 0.176	....	....	2.68 0.088	0.621	0.0090

Table 1 (*continued*)

Laccophilus m. decipiens

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Elko Co., Nevada	♂	9	5.65	0.150	4.36	0.059	(8)	3.27	0.050	2.65	0.054	0.606	0.0058
	♀	22	5.42	0.167	4.19	0.137	(19)	3.19	0.083	2.54	0.076	0.606	0.0052
Los Angeles Co.,	♂	22	5.86	0.194	4.48	0.170	(20)	3.46	0.112	2.74	0.083	0.613	0.0060
California	♀	22	5.61	0.206	4.30	0.165	(11)	3.36	0.176	2.63	0.094	0.612	0.0054
Eldorado Co.,	♂	44	5.78	0.153	4.41	0.118	(17)	3.36	0.124	2.71	0.084	0.614	0.0046
California	♀	44	5.62	0.159	4.25	0.111	(8)	3.25	0.143	2.62	0.072	0.617	0.0041
Bay area,	♂	39	5.73	0.217	4.40	0.145	(21)	3.37	0.142	2.69	0.102	0.612	0.0045
California	♀	39	5.57	0.203	4.24	0.165	(22)	3.13	0.153	2.60	0.091	0.612	0.0044
Benton Co.,	♂	46	5.75	0.179	4.39	0.117	(27)	3.28	0.169	2.67	0.075	0.608	0.0035
Oregon	♀	48	5.55	0.182	4.21	0.147	(17)	3.25	0.111	2.60	0.085	0.618	0.0057
Washington	♂	12	5.78	0.103	4.46	0.093	(8)	3.32	0.086	2.70	0.076	0.605	0.0072
	♀	14	5.70	0.203	4.41	0.096	(9)	3.39	0.117	2.65	0.084	0.601	0.0083
Alberta	♂	8	5.73	0.130	4.37	0.110	....	.....	.....	2.73	0.057	0.626	0.0084
	♀	17	5.62	0.174	4.25	0.134	....	.....	.....	2.64	0.083	0.621	0.0072
Laccophilus m. shermani													
Grand Canyon,	♂	10	5.68	0.145	4.46	0.184	(2)	3.34	.....	2.67	0.045	0.598	0.0109
Arizona	♀	28	5.55	0.238	4.32	0.180	(15)	3.26	0.144	2.59	0.119	0.598	0.0039
Yavapai Co.,	♂	19	5.81	0.186	4.51	0.171	....	3.35	0.119	2.67	0.083	0.592	0.0054
Arizona	♀	25	5.63	0.184	4.37	0.136	(23)	3.31	0.102	2.58	0.092	0.591	0.0048
Maricopa Co.,	♂	29	5.88	0.127	4.60	0.116	(18)	3.46	0.091	2.72	0.063	0.592	0.0039
Arizona	♀	18	5.83	0.194	4.53	0.165	(12)	3.41	0.174	2.70	0.172	0.596	0.0045
Pima Co., Arizona	♂	20	5.82	0.179	4.50	0.138	(7)	3.39	0.051	2.72	0.075	0.604	0.0069
	♀	30	5.63	0.218	4.36	0.130	(14)	3.34	0.115	2.64	0.101	0.606	0.0052

Table 1 (*continued*)

Laccophilus m. shermani

Locality		N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
Santa Cruz Co., Arizona	♂	37	5.80 0.177	4.57 0.143	(32)	3.42 0.103	2.65 0.309	0.593	0.0051
	♀	38	5.70 0.179	4.43 0.163	(25)	3.37 0.104	2.64 0.075	0.596	0.0041
Grant Co., New Mexico	♂	33	5.62 0.156	4.38 0.136	....	3.45 0.123	2.68 0.072	0.612	0.0037
	♀	48	5.51 0.185	4.25 0.170	....	3.41 0.124	2.62 0.097	0.618	0.0031
Lincoln Co., New Mexico	♂	12	5.63 0.183	4.29 0.159	....	3.38 0.148	2.62 0.133	0.610	0.0075
	♀	12	5.48 0.107	4.20 0.119	....	3.39 0.108	2.61 0.121	0.621	0.0077
J. Davis Co., Texas	♂	32	5.83 0.186	4.49 0.122	(18)	3.55 0.074	2.70 0.090	0.601	0.0052
	♀	33	5.62 0.153	4.35 0.117	(21)	3.41 0.100	2.63 0.089	0.604	0.0054
Chihuahua, Chihuahua	♂	21	5.80 0.164	4.49 0.158	....	....	2.66 0.071	0.593	0.0056
	♀	28	5.75 0.178	4.42 0.135	....	....	2.62 0.081	0.592	0.0039
Saltillo, Coahuila	♂	4	5.63 0.068	4.33 0.068	....	3.36 0.027	2.62 0.031	0.604	0.0109
	♀	8	5.36 0.146	4.16 0.117	....	3.25 0.061	2.57 0.070	0.614	0.0094
Durango, Durango	♂	22	5.78 0.131	4.44 0.119	....	3.47 0.081	2.71 0.058	0.611	0.0068
Mazatlan, Sinaloa	♂	4	5.66 0.135	4.36 0.117	....	3.42 0.092	2.66 0.127	0.610	0.0360
	♀	4	5.78 0.117	4.43 0.117	....	3.48 0.093	2.74 0.068	0.619	0.0051
Aguascalientes, Aguas.	♂	5	5.75 0.082	4.43 0.066	....	3.46 0.038	2.66 0.045	0.600	0.0087
	♀	5	5.64 0.061	4.35 0.048	....	3.41 0.045	2.66 0.059	0.610	0.0135
Huasca, Hidalgo	♂	4	5.74 0.120	4.50 0.068	....	3.46 0.076	2.70 0.044	0.601	0.0173
	♀	3	5.54	4.32	....	3.35	2.66	0.617	.....
Puebla, Puebla	♂	7	5.99 0.130	4.57 0.102	....	3.53 0.053	2.81 0.062	0.614	0.0100
	♀	7	5.79 0.086	4.49 0.058	....	3.47 0.054	2.73 0.061	0.608	0.0086

Tergite VIII: pale yellow or light brown. *Venter*: prosternum, its process, and hind legs pale yellow to reddish-brown. *Genitalia*: aedeagus, right paramere, oval plate, ovipositor all reddish-brown; left paramere with yellow on distal half. ANATOMY. *Microreticulation*: weakly double on head, pronotum, and elytra; secondary mesh discernible, but individual cellules still apparent. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: WH/PW, 0.66 to 0.68; LP/PW, 0.42 to 0.43. *Elytra*: female epipleura sometimes with flange; rarely in *decipiens* and *maculosus*, but almost invariably in *shermani* (figs. 276-281); truncation of apices slight. *Venter*: coxal file composed of about 25 to 35 lines; prosternal process with well-defined crest; lobes of postcoxal processes rounded and laterally projecting well posterior to midline (figs. 2, 28); last visible ventral abdominal segment rounded and similar in males and females; that of males slightly produced and with asymmetrical curving ridge in middle (fig. 30); last segment of females weakly arched with posterior margin not noticeably produced. *Legs*: male pro- and mesotarsi enlarged in a dorsoventral plane; palettes easily distinguished at 20 power magnification; male fifth tarsal segment on both pair of legs about one and three-quarters as long as corresponding fourth; profemoral setae (about 6) shorter and finer than mesofemoral ones (8 or 9). *Genitalia*: oval plate (fig. 32) large and produced to acuminate tip; its ventral crest prominent and extending forward with little lateral curvature about one-half the length of the plate; an indefinite number of raised lines lying on either side of crest; right paramere about half as long as left, roughly triangular in outline and heavily sclerotized throughout (figs. 33, 34, 38), with one or two hairs projecting subapically; left paramere while sclerotized at base is less so and more plate-like distally; also with one or two hairs projecting (fig. 38); ovipositor with about 13 to 15 sawlike teeth on each ridge.

Laccophilus maculosus maculosus Say, new status

(Figs. 1, 2, 28-33, 38, 281)

Laccophilus maculosus Say, 1823, pp. 100-101 (taken from J. L. LeConte's editing of the complete writings of Thomas Say, 1891, p. 514). Neotype: male, Bloomington, Monroe County, Indiana, Bloomington, 5 m. N., iv.26.56, J. R. Zimmerman, USNM; Blatchley, 1910, p. 209; Zimmerman, 1960, pp. 142-143.

Laccophilus maculosus (Germar), 1824, p. 30; Aubé, 1838, p. 42; Crotch, 1873, p. 399; Sharp, 1332a, p. 289; Wickham, 1895, p. 72; Leng, 1920, p. 76; Zimmermann, 1920, p. 21; Zimmerman and Severin, 1957, p. 29; Zimmerman, 1960, p. 143; Gordon and Post, 1965, p. 12.

DIAGNOSIS. — Size and elytral pattern serve to separate *m. maculosus* from related subspecies and other sympatric species in northeastern North America. *L. m. maculosus* is the largest *Laccophilus* in the northeastern United States and Canada. The unevenly irrorate pattern with strongly contrasting maculae is a distinctive trait as witnessed by the same epithet given in the syn-

Figure. 1. Dorsal view of *Laccophilus m. maculosus* male.

onymy. The pigment is concentrated around pattern margins and in areas scattered throughout the disc. The accumulation of pigment immediately behind the midlateral spots is suggestive of *L. fasciatus rufus* which has a postmedian stripe or blotch, but *maculosus* is larger (length, about 5.0 to 5.8 mm as compared to 4.5 to 5.1 mm) and the anterior irroration is more marked.

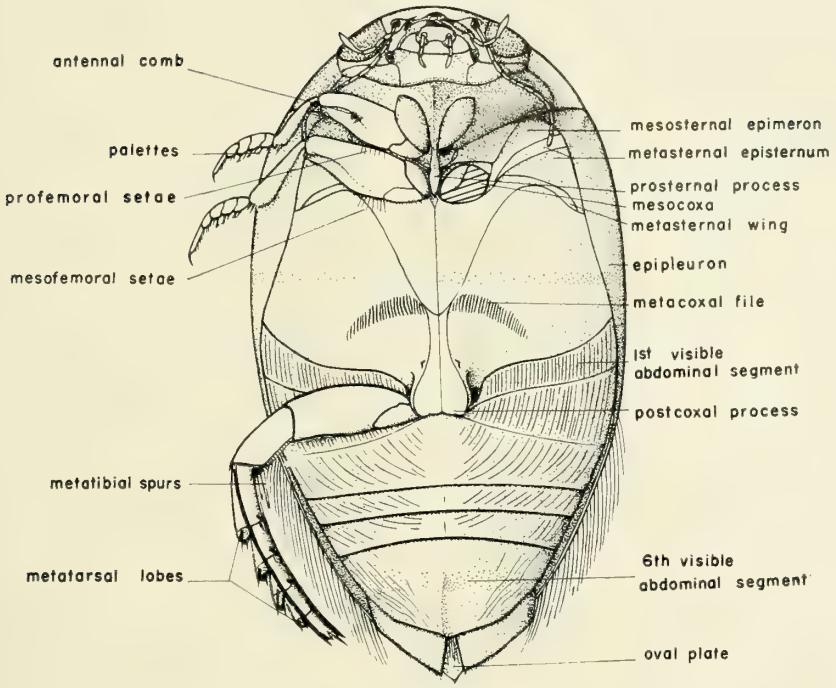

Figure. 2. Ventral view of *Laccophilus m. maculosus* male.

On occasion the smaller *proximus* has been confused with *maculosus,* but the pattern contrast is much stronger in the latter. The three are similar, however, in that they all have the same general elytral pattern outline, belong to those species with a metacoxal file, and have a short prosternal process. No other *Laccophilus* from northeastern North America are irrorated.

NOMENCLATURAL NOTES. — Laccophilus m. maculosus has been ascribed to Germar because Say's description of *maculosus* was long considered to have been published in 1825. LeConte (1891, p. 435), however, gives the date as 1823 with following footnote, "The title page of the 2nd vol. of the New Series of these Transactions bears date 1825, which was the time of completion of the volume, but the late Dr. T. W. Harris informed me in a letter, that he received from Mr. Say a copy of this paper, with the following addition to the title; — 'Printed and published by Abraham Small, 1823.' This, of course, gives Say's name precedence over those published by Germar in his Sp. Ins. Nov. in 1825." Blatchley (1910) did ascribe *macu-*

losus to Say. Zimmermann (1920) made reference to LeConte's edited work, but either overlooked or ignored his opinion and made no reference to Blatchley. I have not seen Germar's type and Say's are presumed lost; hence, a neotype is designated.

Say's description separated two varieties; one (Var. A) is probably *m. maculosus* as it is widely recognized today, but the second (Var. B) is undoubtedly *L. fasciatus rufus* Melsheimer. It seems best to accept the first variety as *maculosus* to avoid more nomenclatural confusion.

VARIATION. — This race shows remarkable uniformity. There is about a 16 percent range in variation in each of four characters with no clearly evident clinal or other geographic differentiation. For example, nearby localities in Michigan may have mean values which differ as greatly as a sample from several hundred miles away in Iowa (Table 1). Mean size of males is slightly larger than females (1.8%), but there is sufficient overlap that small samples usually have broadly overlapping 95 percent confidence limits. Size overlap is nearly complete in the two sexes; in 642 specimens (334 females, 318 males) only eight males were larger in total length than any females, and only three females were smaller than any males (fig. 4).

The elytral pattern reflects the statistical data. The pattern is irregular in outline and intensity of color, but it has much the same appearance throughout its range. Individual variation appears greater than regional variation.

There are differences in the male coxal file between *maculosus* and *decipiens* in coarseness and number of lines, but only estimates of the number of lines are possible. More exact comparisons will have to wait for auditory analysis. *L. m. maculosus* has about 25 to 30 lines in the file and *decipiens* has about 45.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. m. maculosus* occurs from Alabama to Nova Scotia westward to northwestern Colorado, western Nebraska, the Dakotas, and Manitoba, where it intergrades with *L. m. decipiens.* It probably occurs continuously through southern Canada to near Winnipeg. It extends along the Appalachians to near Atlanta, Georgia. There are single specimens from coastal South Carolina, southeastern Alabama, and Dallas, Texas, but the range is probably restricted to near a line running from northeastern Georgia to southwestern Nebraska. I have

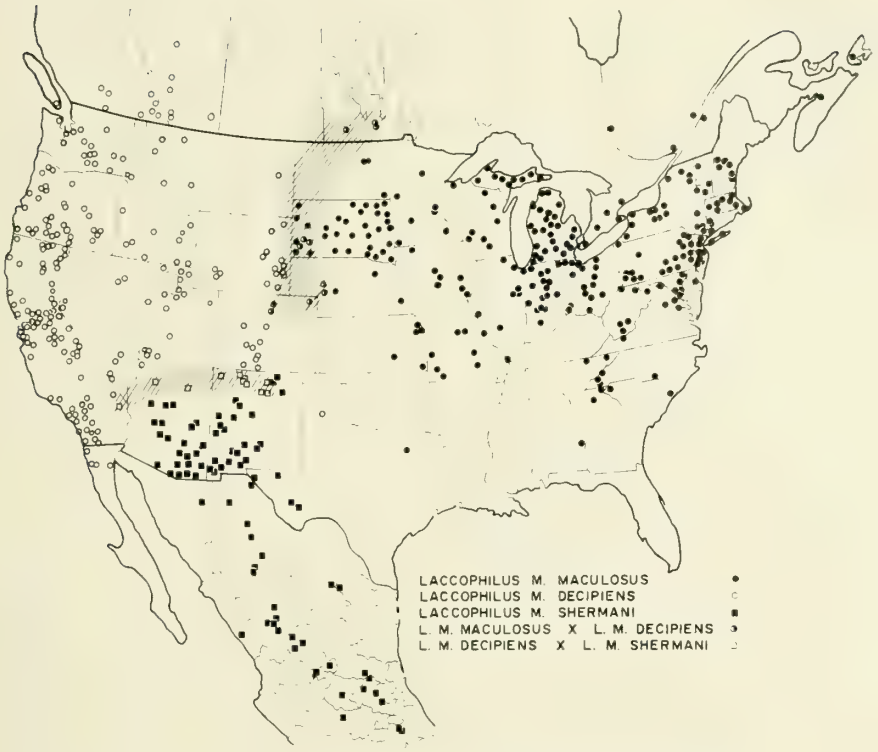
LACCOPHILUS M. MACULOSUS
LACCOPHILUS M. DECIPIENS
LACCOPHILUS M. SHERMANI
L. M. MACULOSUS X L. M. DECIPIENS
L. M. DECIPIENS X L. M. SHERMANI

Figure 3. Distribution of *Laccophilus maculosus*.

made over two hundred collections in Texas, Oklahoma, and Kansas, and have collected it only as far south as Reno County, Kansas, which is about the limit of the range. Single individuals in this and other species have been collected far out of what might be considered the normal breeding range. This should be expected for insects that fly readily and whose adults can survive for short periods in almost any aquatic situation.

This race prefers shallow, partially shaded ponds that tend to have some water in them all year. In Indiana they were more common in glacial, gravelly outwash soils than in clays (Zimmerman, 1960). They have also been reported in waste-oxidation lagoons in Missouri (Roberts, Smith and Enns, 1967) in fish hatcheries in Iowa (Wilson, 1923).

MATERIAL EXAMINED

CANADA. — **NOVA SCOTIA.** Cape Breton Is., 1 ♂, 5 ♀, viii.19.—, G. K. MacMillan (CNG); Truro, 1, viii.5.13, R. Matheson (CNL). **ONTARIO.** Guelph, 8 (USNM); 2 ♂, 1 ♀, iv.20.32, R. H. Ozburn, 2 ♂, vii.—.01 (GLPH). Grimsby, 1 ♂, 1 ♀, J. Pettit (GLPH). London, 1 ♀, 2 ♂, W. Saunders (GLPH). Point Pelee N. P., 1 ♀, v.28.44, B. Malkin (FM). Brimley, 1 ♀, vi.28.36 (SCH). Ridgeway, 4, viii.7.89, E. P. Van Duzee (BERK); 1 ♂, A. H. Kilman; 1 ♂, 3 ♀ (GLPH). Toronto, 2, R. J. Crew (CNL); 1, ix.14.95 (USNM); 1 ♂, xi.33.—, H. B. Leech (MCHS). **QUEBEC.** Duparquet, 1, ix.10.34; 1, viii.20.36; 1, v.15.43; 1, v.15.43; 1, vii.22.43; 1, ix.2.43; 1, ix.28.43, G. S. Smith (CAS); 1 ♀, vii.1.44, G. S. Smith (FM). Levis, 1, viii.31.35, D. Dunavan (USNM). Montreal, 2 ♂, 2 ♀, vi.5.17; 1 ♂, 3 ♀, vii.1.23, J. Quellet (MCHS); 2 ♂, 3 ♀, ix.—.99 (FM). Quebec, 1 ♀, v.22.56 (SCH).

UNITED STATES OF AMERICA. — **ALABAMA.** *Russel County.* Seale, 1 ♂, vi.18.54, R. L. Fischer & D. L. Haynes (MCHS). **CONNECTICUT.** *Fairfield County.* Sheffield Island, 2 ♂, 1 ♀, viii.14.01, J. L. Zabriskic (AMNH). Stamford, 1 ♂, v.—.—, Angel (AMNH). County, 5 ♂, 7 ♀, viii.5.—, C. H. Roberts; 1 ♀, vii.4.— (AMNH). *Litchfield County.* Cornwall, 8, ix.23.20, 1, ix.8.20, 2, x.10.36, Chamberlain (CNL). Goshen, 1 ♀, vii.5.25, L. B. Woodruff (AMNH). Litchfield, 1 ♀, v.1.22; 1 ♂, 3 ♀, ix.3.24, L. B. Woodruff (AMNH). Sharon, 1 ♂, 1 ♀ (LACM). **DELAWARE.** *Kent County.* Bombay Hook, 2, vi.12.54; 11, vi.8-21.54; P. J. Spangler (USNM). **DISTRICT OF COLUMBIA.** Piney Branch, 1, iv.2.05; 2, v.2-16.05; 1, vii.26.06; 1, iv.25.05, D. H. Clemons (USNM). Rock Creek, 1, viii.31.06, D. H. Clemons (USNM). U. S. Fish Comm., Carp Ponds, 4, vii.21.97 (USNM). Washington, 1, iii.4.07, W. L. McAtee; 1, xi.—.—, 1, ix.13.06 (USNM); 2 ♀, iv.15.—, x.20.—, H. S. Barber (USNM); 1 ♂, iv.15.—, H. A. Barber (FM); 1 ♀, C. H. Roberts (AMNH). **GEORGIA.** *Hall County.* Gainesville, 10, iv.2.11 (CNL); 2, iv.2.11 (USNM). *Rabun County.* 1 ♂, 1 ♀, vii.—.—, C. W. Leng (CAS). **ILLINOIS.** *Alexander County.* Olive Branch, 1 ♀, x.8.09, Gerhard (FM). *Champaign County.* Champaign, 1 ♂, 2 ♀, xi.5.27, A. T. McClay (DAV). *Cook County.* Chicago, 3, ix.17.11, E. Lijablad (USNM); 2, iii.9.—, H. Soltau (USNM); 2 ♂, 1 ♀, iv.26.25; 1 ♀, vii.22.06, W. J. Gerhard (FM). Cook Co., 1 ♂, 1 ♀, E. B. Chopa (FM). Edge Brook (Morton Grove), 4, viii.16.04, J. D. Sherman, Jr. (USNM). Evanston, 3 ♂, 3 ♀, x.23.04, A. B. Wolcott (FM). South Chicago, 4 ♂, 4 ♀, ix.14.02; 1 ♀, v.20.06, W. J. Gerhard (FM). *McHenry County.* Cary, 1 ♀, viii.27.05, W. J. Gerhard (FM). *Pike County.* Pittsfield, 1 ♂, vi.17.52, B. Cadwell (DAV). *Vermillion County.* Muncie, 2, iv.20.07 (USNM). Oakwood, 2 ♀, v.5.28, A. T. McClay (DAV). Rossville, 1, vii.10.56, P. S. Spangler (USNM). **INDIANA.** *Brown County.* Brown Co. St. Pk., 9 ♂, 4 ♀, iv.21.56, JRZ (NMSU). *Clinton County.* Kirklin, 3 m. W., 1 ♂, 2 ♀, ix.12.58; 1 ♀, ix.9.58; 9 ♂, 6 ♀, x.3.58; J8 ♂, 2 ♀, x.10.58; 9 ♂, 3 ♀, x.17.58, JRZ (NMSU). *Dubois County.* County, 3 ♂, 5 ♀, x.29.55, J. Hanegan & JRZ (NMSU). *Grant County.* Deer Creek, 5 ♂, 5 ♀, iv.2.56, JRZ (NMSU). *Hamilton County.* Westfield, 1 ♂,

1 ♀, v.4.56, JRZ (NMSU). *Huntington County*. County, 1, iv.2.56, JRZ (NMSU). *La Grange County*. Eddy, 3 m. W., 1, v.2.56, JRZ (NMSU). *Lake County*. Pine (near Gary), 2, (USNM). 2 ♂, 3 ♀, v.21.06, A. B. Wolcott (FM). *Laporte County*. Wanatah, 12 ♂, 15 ♀, viii.12.52, P. J. Spangler (USNM). Laporte, 1 ♂ (CNG). *Kosciosko County*. Winona Lake, 2 ♀, vii.8.55, JRZ (NMSU). *Madison County*. Anderson, 7 ♂, 7 ♀, vi.21.57, JRZ (NMSU). *Marshall County*. Myers Lake, 1, v.4.56, JRZ (NMSU). *Monroe County*. (Note: Only one record is given here, but more than 500 specimens taken over a three year period from all parts of Monroe County are in the author's collection.) Bloomington, 5 m. N., 11 ♂, 17 ♀, ix.17.56, JRZ (NMSU). *Morgan County*. Waverly, 3 ♂, 5 ♀, vi.17.57, JRZ (NMSU). *Noble County*. Wolflake, 5 m. S., 4 ♂, 4 ♀, x.26.56, JRZ (NMSU). *Owen County*. Richland Creek, 3 ♂, 7 ♀, vii.26.55; 3 ♂, 2 ♀, x.22.55, JRZ (NMSU). *Tippecanoe County*. County, 1 ♂, 4 ♀, ix.27.58, N. M. Downie (DAV). *Vigo County*. Terre Haute, 1, Blatchley (USNM). *Wabash County*. Wabash, 3 m. N., 3 ♂, 3 ♀, x.26.56, JRZ (NMSU). *Wayne County*. Richmond, 1 ♂, 1 ♀, viii.7.54, PSB (CAS). *Whitley County*. County, 3 ♂, iv.2.56, JRZ (NMSU) . **IOWA.** *Dickenson County*. L. Okoboji, 1, vi.27.16; 1, vii.14.16, Buchanan (USNM). *Hamilton County*. Jewell, 1 ♂, v.12.41, Sigley (DAV). Little Wall L., 3 ♂, 3 ♀, viii.19.52, P. J. Spangler (USNM). *Henry County*. Mt. Pleasant, 1, iv.14.26, Latta (USNM). Mt. Pleasant, 1, iv.29.26 (USNM). *Johnson County*. Iowa City, 1, iv.7.— (USNM). Solon, 1, iv.20.15, L. Buchanan (USNM). *Lee County*. Ft. Madison, 1 ♀ (FM). *Story County*. Ames, 1, (CNL); 1, xi.20.32, F. Andre (USNM); 1 ♀, iv.23.18, H. A. Scullen (ORES). Indianola, L. Ahquahbi, 4 ♂, 7 ♀, vi.14.52, P. J. Spangler (USNM). **KANSAS.** *Butler County*. Santa Fe Lake, 3 ♂, 2 ♀, iv.4.58, JRZ (NMSU). *Cherokee County*. Galena, 3 (USNM); 1 ♀, Ebb. Crum (AMNH). *Dickenson County*. Elmo, 3 m. S., 1 ♀, vi.16.58, JRZ (NMSU). *Douglas County*. Scorpion Hill, 4 ♂, iv.25.52, P. J. Spangler (USNM). Douglas County, 1 ♀, x.9.45, J. Rozen and B. Lindner (BERK). *Johnson County*. Sunflower, 1 ♂, 1 ♀, ix.7.52, Spangler and Bell (USNM). *Leavenworth County*. Leavenworth St. Pk., Tonganoxie L., 13 ♂, 8 ♀, vi.1.52; 4 ♂, 11 ♀, ix.14.52, P. J. Spangler (USNM). **MAINE.** *Cumberland County*. Casco, 1, ix.1-3.45, J. C. Bradley (CNL). Portland, 2, ix.14.—, J. D. Sherman, Jr. (USNM); 1 ♂, ix.11.— (AMNH). *Kennebec County*. 1, G. M. Greene (USNM). Monmouth (Mommouth, *sic*!), 1 ♀, G. M. Greene (ANSP). *Oxford County*. Paris, 1, vi.16.44, C. A. Frost (CAS). *Reno County*. Haven, 4 m. S., 1 ♀, vii.19.60, JRZ (NMSU). *York County*. Kittery Point, Cutts. I., 3, vii.—.24 (USNM). Moody, Moody Beach, 1 ♂, viii.23.54, P. J. Spangler (USNM). Saco, 2, v.19.38, W. Nutting (ARI). **MARYLAND.** *Baltimore County*. Lutherville, 1, vii.9.74 (USNM). 3, viii.22.— (USNM). *Harford County*. Edgewood, 2, ix.2-17.18, H. Dietrich (CNL). *Montgomery County*. Plummer's I., 2, iii.24.02, W. L. McAtee; 4, ii.23-29.07, D. H. Clemons; 1, iv.24.07, W. L. McAtee; 2, H. S. Barber (USNM). Kensington, 22, vi.6-17.61, J. W. Fitzgerald (USNM). Cabin John, 1, vii.13.—, L. L. Buchanan (USNM).

Prince Georges County. College Park, 2, x.—.33, R. A. Littleford (USNM). Hyattsville, 1, vii.4.11 (USNM). Branchville, 2, iv.25.26, L. Buchanan (USNM). **MASSACHUSETTS.** Barnstable, Woods Hole, 1, ix.25.81 (USNM). *Berkshire County*. Egremont, 2 ♂, 5 ♀, vi.21.—, C. H. Roberts (AMNH). *Bristol County*. Taunton, 1 ♀, ix.24.36 (AMNH). *Essex County*. Ipswich, 1 ♀, vii.1.— (AMNH). Lawrence, 4, ix.25.20, E. W. Mank (CNL); 1, —.—.19, E. W. Mank (CNL). *Hampden County*. Springfield, 8, vi.15-17.16; 3, iii.24-28.17, E. A. & W. H. Chapin (USNM); 1, iv.19.00, F. Knat (USNM). Wilbraham, 1 (CNL); 1, viii.—.95 (USNM). *Hampshire County*. Amherst, 1 ♀, 1 ♂, vii.11.26, K. A. Salman (LACM); 1 ♂, x.4.63, D. April (SCH). Holyoke, Holly Ledge, 4, iv.24.99, G. Dimwock (CNL). Mt. Tom, 4, iii.25.17, E. A. Chapin (USNM). *Middlesex County*. Cambridge, 1 (USNM). Melrose (High), 12, iii.15.—, D. H. Clemons (USNM). Watertown, 1 ♀, v.17.21, R. F. Hussey (MCHS). *Norfolk County*. Milton, 3 ♂, 2 ♀, iii.13.42, H. Clench & K. Christiansen (CNG); 1 ♀, iv.3.41, H. Clench (SCH). Needham, 1, ix.1-2.45, J. C. Bradley (CNL). *Suffolk County*. Brookline, 2 (BERK). *Worcester County*. Southboro, 1 ♂, iv.13.39, J. G. Thorndike (AMNH). **MICHIGAN.** *Alcona County*. Barton City, 4 ♂, 1 ♀, vii.23.63, R. B. Willson (MCHS). *Alger County*. Chatham, 1 ♀, V. E. Shelford (AMNH). Munising, 10 m. S., Big Twin Lake, 2 ♂, 2 ♀, vii.22.64, R. B. Willson (MCHS). *Allegan County*. Allegan St. Forest, 1 ♀, vii.22.63, G.C. Eickwort (MCHS). *Baraga County*. Anse, 8 m. S., 2 ♂, 3 ♀, vii.10-11.64, R. B. Willson (MCHS). *Barry County*. County, 1 ♂, iv.29.55, R. L. Fischer (MCHS). *Bay County*. County, 5 ♂, 1 ♀, viii.11.51, R. R. Dreisbach (MCHS). *Berrien County*. Napier, Wolk Creek, 1 ♂, ix.17.64, R. B. Willson (MCHS). Near Sawyer, Warren Dunes St. Pk., 19 ♂, 23 ♀, P. J. Spangler (USNM). Stevensville, 2 ♂, 1 ♀, vii.12.63, R. B. Willson (MCHS). *Calhoun County*. Olivet, 4 m. S., Indian Ck., 20 ♂, 20 ♀, x.5.63, R. B. Willson, R. W. Matthews (MCHS). *Cheyboygan County*. Black L., 1 ♂, vi.30.47, P. A. Hawkins (MCHS); 1 ♂, vi.23.49, J. D. Lattin (ORES). Douglas L., 3 ♂, 3 ♀, vii.4.31, C. W. S. (MCHS); 5 ♂, 4 ♀, vi.24.52, P. J. Spangler (USNM). Nelson L., 3 ♀, viii.16.52, J. P. Spangler (USNM). Smith's Bog, 1 ♀, viii.4.52, P. J. Spangler (USNM). *Chippewa County*. McCarron, Charlotte R., Beaver Ck., 40 ♂, 41 ♀, viii.2-4.64, R. B. Willson (MCHS). *Clare County*. County, 3 ♂, x.5.49, viii.2.51, R. R. Dreisbach (MCHS). *Clinton County*. Bath, 1 ♂, 4 ♀, iv.18.64, R. B. Willson (MCHS); 1 ♂, iv.29.60, C. A. Scheibner (MCHS). Park Lake, 18 ♂, 21 ♀, viii.17.63, R. B. Willson (MCHS). *Delta County*. Escanaba, 1, vii.17.—, Hubbard & Schwarz (USNM). Escanaba, Portage Ck., 4 ♂, 2 ♀, R. B. Willson (MCHS). St. James, 17 m. N., 1 ♀, vi.22.64, R. B. Willson (MCHS). *Eaton County*. Grand Ledge, 1, Hubbard & Schwarz (USNM). Eaton Rapids, 1 ♂, viii.3.43, C. W. Sabrosky (MCHS). Olivet, Indian Ck., 2 ♂, 2 ♀, x.5.63, R. B. Willson (MCHS). *Emmett County*. Levering, Carp R., 1 ♀, viii.5.52, P. J. Spangler (USNM). Pellston, 12 ♂, 7 ♀, vii.7.52, viii.5-8.52, P. J. Spangler (USNM). County, 1, vii.25.52, P. J. Spangler (USNM). *Genesee County*. Flint, 16 ♂, 12 ♀, ix.7.63, v.30.64, vii.25.64, R. B. Willson (MCHS). *Gladwin County*. White Star, 1 ♂, ix.4.49, R. L.

Fischer (MCHS). County, 2 ♂, 1 ♀, vii.20.49, R. R. Dreisbach (MICHSU). *Gogebic County*. Wakefield, Black R., 1 ♀, vi.17.64, R. B. Willson (MCHS). *Gratiot County*. County, 1 ♂, 3 ♀, vi.10.49, R. R. Dreisbach (MCHS). *Houghton County*. Chassell, 1 ♂, 1 ♀, vi.24.64, R. B. Willson (MCHS). Houghton, 1 ♂, vii.7.64, R. B. Willson (MCHS). *Ingham County*. E. Lansing, 1 ♂, 1 ♀, iv.23.63, 1 ♀, viii.26.63, 1 ♀, v.5.38, R. B. Willson (MCHS). Haslett, 2 ♂, ix.13.55, R. Fischer (MCHS). *Isabella County*, 3 ♂, 3 ♀, ix.11.48, R. R. Dreisbach (MCHS). *Kalamazoo County*. Gull Lake Biol. Sta., 1 ♂, 1 ♀, vii.18.63, Fischer & Matthews (MCHS); 1 ♂, x.28.63, R. B. Willson (MCHS). *Kent County*. Grand Rapids, 2 ♂, 2 ♀, viii.24.37 (MCHS); 2 ♂, 2 ♀ (FM). *Keweenaw County*. Anmeek, 3 m. N., 1 ♂, vii.8.64, R. B. Willson (MCHS). Bete Grise Bay, 7 ♂, 3 ♀, vii.7.64, R. B. Willson (MCHS). Isle Royale, 2 ♂, 1 ♀, vii.3.64, R. B. Willson (MCHS). *Leelanau County*. Glen Arbor, Sleeping Bear Dunes, Glenh., 3 ♂, 3 ♀, viii.17.52, P. J. Spangler (USNM). *Luce County*. Dollarville, 1 ♂, 4 ♀, vii.31.64, R. B. Willson (MCHS). Paradiseville, 11 m. WNW., 1 ♀, vii.31.64, R. B. Willson (MCHS). Newberry, Tanguamonon R., 4 ♂, 3 ♀ (MCHS). *Mackinac County*. Cedarville, 2 ♂, 4 ♀, viii.5.64, R. B. Willson (MCHS). Hessel, Law Ck., 1 ♂, viii.5.64, R. B. Willson (MCHS). *Marquette County*. Champion, 1 ♀, vii.13.65, R. B. Willson (MCHS). County, 2; 4, vii.21.6, J. D. Sherman, Jr. (USNM); 8 ♂, 2 ♀, vii.17-19.65, R. B. Willson (MCHS). *Mason County*. Pere Marquette & Great Sable R., 6 ♂, 8 ♀, viii.8.52, P. J. Spangler (USNM). *Midland County*, 9 ♂, 7 ♀, viii.8.48, ix.10.48, x.1.49, vii.25.51, viii.5.51, R. R. Dreisbach (MCHS). *Missaukee County*. Merritt, 12 m. NE., 3 ♂, 6 ♀, ix.6.63, R. B. Willson (MCHS). *Monroe County*. Monroe, 2, ix.—.—, Hubbard & Schwarz (USNM). *Montcalm County*. Flat River Game Area, 2 ♀, v.14.55, R. L. Fischer (MCHS). *Oakland County*. Ortonville, 2 ♂, 1 ♀, viii.4.10, vii.3.28, A. W. Andrews (MCHS); 1 ♀, vii.14.49, R. R. Dreisbach (MCHS). *Ottawa County*. Allendale, 5 ♂, 6 ♀, vii.17.63, R. B. Willson (MCHS). Zeeland, 11 ♂, 14 ♀, viii.9.63, R. B. Willson (MCHS). County, 2, viii.31.—, E. A. P. (USNM). *Roscommon County*, 1 ♀, vi.20.53, R. R. Dreisbach (MCHS). *Schoolcraft County*. Germfask, 15 ♂, 32 ♀, vii.25-29.64, R. B. Willson (MCHS). *Shiawassee County*. Owosso, 1 ♂, vii.23.53, Bruce Wilson (MCHS). *St. Clair County*. Port Huron, 1 ♂, 1 ♀, vii.—.42, D. G. Kelley (CAS). *Van Buren County*. South Haven, 1, viii.11.04, J. D. Sherman, Jr. (USNM); 2 ♂, 1 ♀, vi.1.91 (MCHS). *Washtenau County*. Chelsea, 7 ♂, 1 ♀, vii.15.54, R. L. Fischer (MCHS). County, 1 ♂, 1 ♀, v.11.44, Wilmordk (CAS); 1 ♀, iv.18.45, R. L. Fischer (MCHS). *Wayne County*. Detroit, 2, vi.1.—, Hubbard & Schwarz (USNM). **MINNESOTA**. *Anoka County*, 1, iv.25.36, H. R. Dodge (CAS). *Hennepin County*. Excelsior, 1, J. D. Sherman, Jr. (USNM). Minneapolis, 1, ix.7.15; 1, vi.29.16; 1, v.25.20, F. C. Fletcher (CNL). Minnetonka, 4, viii.2.23, F. C. Fletcher (CNL). *Itasca County*. Little Winnebegosish (Lake?), vi.10-11.35, K. Cooper (USNM). *Olmsted County*. Rochester, 10, J. D. Sherman, Jr. (USNM). *Ottertail County*. Fergus Falls, 1, viii.19.11, Stoner (USNM). *Ramsey County*. St.

Paul, 5, J. D. Sherman, Jr. (USNM). *Renville County*. Buffalo L., 10, J. D. Sherman, Jr. (USNM). *Rock County*. Lucerne, 1 ♀, vi.14.55, W. A. Drew (MICHSU). **MISSOURI**. *Barry County*. Cassville, Roaring River St. Pk., 1, iv.22.55, M. C. Grabeau (USNM). 1 ♂, x.8.54, P. J. Spangler (USNM). *Boone County*. Ashland, 2 ♂, 3 ♀, v.8.55, P. J. Spangler (USNM). Columbia, 1, v.8.37, W. M. Gordon (CNL). 1, vi.—.—, 2, C. V. Riley (USNM). 1 ♀, x.8.54, P. J. Spangler (USNM). Deer Pk., 6 m. E., 1, viii.28.53, P. J. Spangler (USNM). *Callaway County*. Kingdom City, 4 m. N., 1, vii.16.53, P. J. Spangler (USNM). *Crawford County*. Meramec R., St. Rd. 8, 3, vii.21.53, P. J. Spangler (USNM). *Lawrence County*. Verona, 1 ♂, vii.7.53, P. J. Spangler (USNM). *Shannon County*. Winona, Lewis L., 3 ♂, 4 ♀, iv.9.55, P. J. Spangler (USNM). *St. Louis County*. Howard Bend, 1, vi.28.37, W. M. Gordon (CNL). St. Louis, 4, vii.—.77 (USNM); 1 ♀, vi.8.32 (CRNG). *Vernon County*. Near Nevada, 2 ♂, 1 ♀, v.14.58, J. W. McReynolds (CAS). **NEBRASKA**. *Holt County*. Stuart, 2 m. NW., 1, vi.3.37, C. E. Burt (USNM). *Lancaster County*. Lincoln, 7 ♂, 6 ♀, x.15.60, W. F. Rapp, Jr. (NMSU). *Logan County*. Stapleton, 1 m. N., 2 ♂, vii.15.67, H. B. Leech (CAS). *Holt County*. Stuart, 2 m. NW., 1, vi.3.37, C. E. Burt (USNM). *Otoe County*. Palmyra, 1 ♂, W. F. Rapp, Jr. (WFR). **NEW HAMPSHIRE**. *Carroll County*. N. Conway, 1, vi.15.46, C. A. Frost (CAS). *Coos County*. Carter Lake, 12 (USNM). Jefferson Junction, 1, J. D. S., Jr. (USNM). Mt. Adams, 4 ♂, vii.24.—; 1 ♀, vii.14.—; 7 ♂, 2 ♀, viii.27.— (AMNH). Mt. Washington, 7; 2, vii.30.95, J. D. S., Jr. (USNM); 2 ♂, 3 ♀, Mrs. A. T. Slosson; 2 ♀, ix.—.—, J. D. Sherman, Jr.; 1 ♀, vi.—28, R. Dow (USNM). Pittsburg, Conn. R., 6, viii.16.25, Chamberlain (CNL). Randolph, 6, J. D. Sherman, Jr. (USNM). Starr Lake, near Mt. Adams, 55; 1 ♀, J. D. Sherman, Jr. (AMNH). White Mts., 1 ♀ (AMNH). **NEW JERSEY**. *Bergen County*. Dumont Woods, 1 ♀, v.6.34, C. L. Ragot (FM). Passaic R., 4, vii.1.33, Shoemaker (USNM). Ramsey, 4 ♂, 2 ♀, vi.7.—, C. H. Roberts; 2 ♂, 3 ♀, vii.13-16.12 (AMNH). Westwood, 107, ix.7.—; 2 ♂, 4 ♀, vii.26.—; 4 ♂, 5 ♀, viii.30.—; 1 ♂, vii.7.—; 5 ♂, 7 ♀, x.11.—; 4 ♂, 1 ♀, x.17.— (AMNH). County, 1, iv.20.02; 4, v.11.02, Shoemaker (USNM). *Burlington County*. Bridgeboro, 1 ♂, iv.26.41, E. J. F. Marx (AMNH). Hartford, 1 ♂, 1 ♀, xii.28.40, E. J. F. Marx (AMNH). Medford, 2 ♂, vii.20.41, E. J. F. Marx (AMNH). Moorestown, 1 ♂, 1 ♀, vi.29.41, E. J. F. Marx (AMNH). Lanola, 9 ♂, 12 ♀, vi.29.41; 2 ♂, viii.17.40, E. J. F. Marx (AMNH). *Camden County*. Clemonton, 12, vii.26.96; 1, v.16.97; G. M. Greene (USNM); 1 ♂, vii.1.— (ANSP). Delair, 1 ♂, vi.1.— (AMNH). County, 1 ♂, vi.8.—, E. L. Dickerson (AMNH). *Essex County*. Newark, 3 ♂, E. L. Dickerson (AMNH). *Gloucester County*. Pitman, 1, ix.22.37, J. C. Bradley (CNL). *Middlesex County*. Avenel, 2 ♂, v.16.—, Berk (MCHS); 1 ♀, v.22.31, Siepmann (FM). Amboy Mdw., 2 ♂, vi.27.—, E. L. Dickerson (AMNH). Spotswood, 1 ♂, vii.4.—, E. L. Dickerson (AMNH). *Morris County*. Boonton, 2, v.10-12.01; 1, iii.30.17, G. M. Greene (USNM). Lincoln Park, 1, viii.13.02, R. Godfrey (USNM). Lower Longwood.?, Rockaway R., 1 ♀ (BERK). *Ocean County*. Lakehurst, 1, ix.1.01; 1 (USNM); 3 ♂, 2 ♀, v.24.—; 1 ♀, v.31.—; 2 ♀, vi.13.—, C. H. Roberts (AMNH). *Pas-*

saic County. Patterson, 1 ♂, iv.21.—; 1 ♂, v.3.—; 4 ♂, 1 ♀, vii.4.— (AMNH). Wanague, 2 ♂, 1 ♀, v.12.40, B. Malkin (FM). *Somerset County*. Metuchem, 1 ♂, v.5.— (AMNH). Milltown, 1 ♂, 1 ♀, iii.14.— (AMNH). New Brunswick, 1 ♀, vii.27.—; 1 ♂, viii.9.—, E. L. Dickerson (AMNH). *Union County*. Rahway, 1 ♂, vii.19.31, Siepmann (FM). 1 ♂, iv.20.—, E. L. Dickerson (AMNH). *Warren County*. Great Piece? Mew., 3 ♂, ix.3.—, E. L. Dickerson (AMNH). Hope, 1 ♂, 1 ♀, xi.9.41, E. J. F. Marx (CAS). **NEW YORK**. *Bronx County*. Bronx Pk., 1 ♂, 3 ♀, viii.—.—; 21, ix.—.— (AMNH). Van Cordlandt Pk., 1, ix.13.—, Shoemaker (USNM); 1 ♂, v.4.41, Greame Kelley (CAS); 1 ♂, v.4.41 (FM). *Chataqua County*. L. Chataqua, 1 ♂, z ♀, viii.—.— (CNG). *Courtland County*. McLean Bogs, 10, viii.7.17, H. Dietrich (CNL). Mud Pond, McLean Res., 1, ix.24.25 (CNL). *Erie County*. Buffalo, 2 (USNM); 3 ♀ (AMNM); 3, E. P. Van Duzee (BERK). Colden, 1 ♀, vii.33.16, M. C. Van Duzee (CAS). Evans, 1, vi.16.85, C. V. Riley (USNM). Lancaster, 10 ♂, 1 ♀, vii.20.08, M. C. Van Duzee (CAS). Tonawanda, 1 ♀, vii.9.16, M. C. Van Duzee (CAS). *Essex County*. Au Sable Lake, 3 (USNM). Mt. Marsey, L. Tear, 1, J. D. Sherman, Jr. (USNM). Mt. Mary, 1, viii.6.14, J. D. Sherman, Jr. (USNM). *Franklin County*. Coreys, 1 ♀, x.12.28, W. J. Gerhard (FM). *Green County*, 1 ♀ (CNG). *Kings County*. Cypress Hills, 3 ♀, v.17.90; 1 ♂, 1 ♂, v.21.90; 2 ♂, 1 ♀, v.23.90; 1 ♀, vi.5.90; 4 ♀, viii.17.91, J. L. Z. (AMNH). Flatbush Waterworks, 4 ♂, 5 ♂, iv.30.90; 1 ♀, v.3.90; 1 ♀, v.12.90 (AMNH). *Manhattan County*. N.Y.C., 5, Hanwitta (USNM). *Monroe County*. Rochester, 2 ♀, vii.1.42; 18 ♂, 10 ♀, ix.9.44; 1 ♂, 1 ♀, ix.23.44; 2 ♂, 1 ♀, vi.23.45; 1 ♂, 1 ♀, vi.30.45, F. C. Fletcher (LACM). *Nassau County*. Wantaugh, L. I., 3 ♂, vii.22.39; 3 ♂, 1 ♀, iv.12.41 (FM). *Niagara County*. Olcott, 1, iv.3.21; 1, vii.17.21; 4, viii.14.27, H. Dietrich (CNL). *Onondaga County*. Manlius, 2, ix.4.71, H. H. Smith (CNL). *Orange County*. Ft. Montgomery, 1 ♂, iv.20.41 (FM). West Point, 4, iv.19.09; 1, v.21.10; 14, vi.9-18.10, W. Robinson (USNM). Cunningham Park, 2 ♂, vii.13.41; 2 ♀, ix.30.40-41, G. Kelley (CAS). Forest Pk., 1, v.15.04; 4, x.23.04; 2, v.16.10, Shoemaker (USNM). Kissena Park, 2 ♂, 1 ♀, viii.30.40, Greame Kelley (CAS). *Richmond County*. Staten Island, 4, x.23.04; 1, iv.12.08; 3, iv.16.05 (USNM); 2 ♂, 6 ♀, ix.27.38; 3 ♂, 5 ♀, x.1.38; 2 ♂, iv.7.39; 1 ♂, 4 ♀, iv.16.39; 1 ♀, v.14.39; 2 ♂, 4 ♀, v.20.39; 1 ♂, vi.7.39; 1 ♀, ix.9.39; 1 ♀, vii.22.40 (FM); 1 ♂, 2 ♀, iv.19.—, C. H. Roberts; 1 ♂, v.7.25, Woodruff; 3 ♂ (AMNH). Tompkins Cave, 9 ♂, 16 ♀, viii.10.10 (AMNH). *Rockland County*. Nyack, 5 ♂, 4 ♀, x.—.86, J. O. Zabriskic (AMNH). Scarsdale, 1 ♂, v.4.20 (MCHS). *St. Lawrence County*. Canton, 1 ♂, 1 ♀, v.15-16.33 (ORES). *Schuyler County*. Watkins Glen, 1 ♂, Mrs. A. T. Slosson (AMNH). *Suffolk County*. Fisher's Island, 3 ♂, 2 ♀, viii.17.91, J. L. Z.; 24 ♂, 13 ♀, viii.29.90 (AMNH). Orient, L. I., 1, ix.20.42, Roy Latham (CNL). *Tomkins County*. Ithaca, 1, vii.26.07; 2, iv.15.13; 1, iv.12.15; 4, iv.15.15; 1, iv.25.15; 2, v.15.15; 1, vii.6.16; 9, viii.17.16; 1, viii.23.16; 3, ix.2.16; 4, ix.10.16; 5, ix.17.16; 2, ix.22.16; 1, ix.24.16; 1, vii.9.17; H. Dietrich (CNL); 1, vii.12.20, E. Mank; 1, vii.20.22; 1, viii.17.22; 2, ix.5.22 (CNL);

4, vii.—.— (CNL); 4, Chttn. (USNM). Cascadilla, 1, v.28.24, F. C. Fletcher; 1, iv.28.39; W. M. Gordon; 1, viii.24.40, E. Dietrich (CNL). *Ulster County.* Esopus, 2 ♀, ix.2.—, C. H. Roberts (AMNH). W. Shokan, 11 ♂, 6 ♀, vii.30.09 (AMNH). *Washington County.* W. Hebron, 1 ♂, 1 ♀, vi.30.—, C. W. Leng (AMNH). *Wayne County.* Sodus Bay, 1, viii.14.09, A. C. Weed (USNM). *Westchester County.* N. Rochelle, 1 ♂, viii.3.10 (AMNH). Peekskille, 1, viii.16.90 (CNL); 7, iv.14.90, J. D. Sherman, Jr. (USNM); 1, x.18.—, J. D. Sherman, Jr. (USNM). Yonkers, 1, ix.7.—, Shoemaker (USNM). **NORTH CAROLINA.** *Buncombe County.* Asheville, 3, iv.21-26.44, W. E. Hoffman (USNM); 1 ♀, ix.—.95 (AMNH). Black Mts., 4 ♂, 2 ♀, v.17.—; 1 ♂, viii.19.06, W. Beutenmuller (AMNH). *Macon County.* Highlands, 1 ♂, vi.8.61, O. S. Flint (USNM). *Madison County.* Hot Springs, 2 ♀, Mrs. A. T. Slosson (AMNH). *Richmond County.* Hoffman, 2 ♂, 3 ♀ (NMSU). *Swain County.* Fontana, L., 2 ♂, v.18.27; Bryson City, 8 m. SW., 1 ♀, v.18.57, JRZ (NMSU). **NORTH DAKOTA.** *Nelson County.* Stump, L., E. Gate Pond, 2, vii.7.21, C. K. Sibley (CNL). Petersburg, 1 ♀, vii.20.54, PSB (CAS). *Richland County.* Hankinson, 1, vii.23,24.17, D. C. Mabbot (USNM). **OHIO.** *Athens County.* Athens, O. U. Airport, 8, vi.20,30.50, P. J. Spangler (USNM); 1, ix.17.50, P. J. Spangler (USNM). Waterloo Twnp., 2, iv.6.50, P. J. Spangler (USNM); 10, vi.27.50, P. J. Spangler (USNM). Locust Heights Nt. Pt., 2, x.15.49, P. J. Spangler (USNM). Waterloo Lake, 4, iv.23.50, P. J. Spangler (USNM). Burr Oak Dam, 2, vii.22.50, P. J. Spangler (USNM); 1 ♂, ix.30.56, W. C. Stehr (CAS). *Coshocton County.* Conesville, 1, vii.23.50, P. J. Spangler (USNM). *Cuyahoga County.* Cleveland, 1, vii.—.17, H. Soltau (USNM). *Franklin County.* Columbus, 2 ♂, 2 ♀, vii.20.40 (AMNH). *Fulton County.* Brush Ck., 2 ♂, ix.17.52, I. Slesnick (USNM). Wausson, 5 ♂, 7 ♀, ix.21.52, I. Slesnick (USNM); Harrison L., 5 ♂, 12 ♀, ix.27.52, I Slesnick (USNM). *Hamilton County.* Cincinnati, 1, vii.17.—, Wickham (USNM). *Lytle Creek,* viii.2.51, A. R. Gaufin (AMNH). *Lucas County.* Cedar Pt., 2, vi.25-26.13, Jaques (USNM). *Muskingum County.* Adams Mill, 1, viii.25.50, P. J. Spangler (USNM). *Ottawa County.* Oak Harbor, 4 ♂, 1 ♀, viii.8-9.61, C. P. McRoy (MCHS). Put-in-Bay, 1 ♂, 1 ♀, vii.15.61, C. P. McRoy (MCHS). *Ross County.* Londonderry, 2, viii.5.50, P. J. Spangler (USNM). *Sandusky County.* Castalia, 1 ♀, viii.18.61, C. P. McRoy (MCHS). *Scioto County.* Roosevelt Lake, 2, vii.29.50, P. J. Spangler (USNM). *Vinton County.* Lake Hope, 1 ♂, vii.22.52; 2 ♂, 2 ♀, x.7.58, W. C. Stehr (CAS). *Warren County.* Mason, 2 m. S., 6 ♂, 7 ♀, vi.24.57, JRZ (NMSU). *Wayne County.* County, 1, v.21.41, R. W. Rines (CAS). Killbuck Swamp, 2 ♂, v.21.41, R. Rines (FM). *Williams County.* County, 9 ♂, 10 ♀, ix.23.52, I. Slesnick (USNM). *Wyandot County. Sycamore,* 5 ♂, 18 ♀, viii.10.54; 1 ♂, 7 ♀, viii.12.54, P. S. Bartholomew (CAS). **PENNSYLVANIA.** *Adams County.* Arendtsville, The Narrows, 3, vii.4.51, P. J. Spangler (USNM). Gettysburg, 1, x.1.—, J. D. Sherman, Jr. (USNM). Starrers, 5, vi.15.47, P. J. Spangler (USNM). *Allegheny County.* County, 3, iv.5.90, E. A. Klages (CNL). County (?), 1 ♂, 3 ♀ (FM); 5 ♂, 2 ♀ (CNG). Harmarville, 2 ♂, 1 ♀, ix.1.— (CNG). Pittsburgh, 2 ♂, 6 ♀, ix.4.— (ORES); 11 ♂, 5 ♀, ix.2.—, 191 stacked on cards, ix.4.—; 19 ♂,

22 ♀, ix.4.—; 12 ♂, 11 ♀; 3 ♂, 3 ♀, vii.14.—; 2 ♂, 1 ♀, vii.—.02; 2 ♂, 1 ♀, v.8.25; 1 ♀, v.25; 2 ♂, 3 ♀, v.28.—; vii.16.24 (CNG). Wilmerding, 2 ♂, 2 ♀ (CNG). *Berks County*. Kempton, 1 ♀, vii.12.46, P. Vaurie (AMNH). Lenhartsville, 2 ♂, 2 ♀, vii.10.46, P. Vaurie (AMNH). *Bucks County*. Tohickon, 1 ♀, ix.29.41, E. J. F. Marx (CAS). *Clearfield County*. Shawville, 1 ♂, vii.20.40, J. Bauer (CNG). *Delaware County*. Ardmore, 4 ♂, ii.14.33; 1 ♂, 2 ♀, iv.9.33; 2 ♂, 2 ♀, iv.22.33 (SCH). County, 2 ♂, 1 ♀, v.18.— (ANSP). *Erie County*. Lake Le Boeuf, 2 ♀, G. E. Wallace (CNG). Presque Isle, 1 ♀, vii.29-viii.3.40, G. E. Wallace (CNG). *Fayette County*. Ohiopyle, 3 ♂, 6 ♀, viii.28.07, Hugo Kahl; 1 ♀, vi.30.31, W. D. McIlvoy, Jr. (CNG). *Franklin County*. Blue Ridge Summit, 1 ♂, vii.—.43, D. Rockefeller (AMNH). Chambersburg, 1, J. D. Sherman, Jr. (USNM). Laurel L., 1 ♂, 3 ♀, viii.5.—, P. J. Spangler (USNM). *Lackawanna County*. Spring Brook, 4, v.22.45 (USNM). *Lebanon County*. Mt. Gretna, 12, iv.5,9.45, P. J. Spangler (USNM). Indiantown Gap M. Res., 2, iv.7.50, P. J. Spangler (USNM). *Lehigh County*. Lehigh Gap, 1, vii.11.99; 10, vii.12.04; 6, viii.10.04; 79, vii.24-27.05; 6, viii.3.05, G. M. Greene (USNM). *Luzerne County*. Dupont, 1, viii.16.04, H. L. Townes (USNM). Newtown, 1 ♀, v.16.25, C. B. Woodruff (AMNH). *Monroe County*. Canadensis, 1, vii.15.26, Shoemaker (USNM). *Northampton County*. Easton, 1 ♂, 3 ♀, vii.21.34, J. W. Green (FM). *Perry County*. New Bloomfield, 1 ♀, vii.—.40 (AMNH); 1 ♀, vii.—.40, A. B. Champlain (LACM). *Philadelphia County*. Philadelphia, 1, vii.14.—, C. Ilg. (CNL); 4, x.17.—; 1, vii.8.97, G. M. Greene (USNM); Philadelphia Neck, 66, x.30.—; 12, x.17.96, G. M. Greene (USNM); 1, vii.15.04, Kaeber (USNM); 2 ♂, 6 ♀, v.29.98 (FM); 1 ♂ (AMNH); 1 ♂, 2 ♀, v.4.—; 1 ♀, v.12.—; 2 ♂, v.18.—; 1 ♀, vii.17.—; 8 ♂, 3 ♀, ix.13.— (ANSP). Mt. Airy, 1 ♂, v.30.— (ANSP). *Pike County*. Milford, 3 ♂, v.1.41, B. Malkin (FM). *Somerset County*. Kooser St. Pk., 1, viii.11.51, P. J. Spangler (USNM). *Washington County*. Canonsburg, 3 ♂, 1 ♀, i.6.52, C. W. Staford; 1 ♀, iv.6.51 (CNG). *Westmorland County*. Jeannette, 1 ♀, vi.—.—; 6 ♂, 7 ♀, vii.—.—; 2 ♂, vii.4.—; 1 ♀, vii.10.—; 1 ♂, vii.14.—; 1 ♂, vii.15.—; 1 ♂, 4 ♀; H. G. Klages (CNG). *York County*. Davidsburg Run, 12, vi.11.50, P. J. Spangler (USNM). Sheepshead Bridge, 7, iv.7.50, P. J. Spangler (USNM). Washington Twp., 1 ♂, 2 ♀, vii.7.61, P. J. Spangler (USNM). Wrightsville, 1, vii.29.51, P. J. Spangler (USNM). York, 2 m. SW., 2, iv.10.50, P. J. Spangler (USNM). **SOUTH CAROLINA**. *Horry County*. Little River, 1, xii.15.29, D. Dunavan (USNM). *Pickens County*. Pickens, 2, vii.3.27, D. Dunavan (USNM). **SOUTH DAKOTA**. Brookings County. Brookings, 4, J. D. Sherman, Jr. (USNM). *McPherson County*. Leola, 4 m. W., 1 ♀, vii.24.40, H. C. Severin (CAS). *Todd County*. Rosebud, 3 m. E., 1 ♀, ix.5.40, H. C. Severin (CAS). **TENNESSEE**. *Campbell County*. Cove L. St. Pk., 2 ♂, 1 ♀, viii.14.50, F. N. Young (AMNH). *Sullivan County*. Bristol, 1, v.7.51, B. A. Barrington (CNL); 1 ♂, 1 ♀, v.7.51 (AMNH). **TEXAS**. *Dallas County*. Dallas, 1 ♂ (AMNH). **VERMONT**. *Bennington County*. Bennington, 1 (USNM). County, 2 ♀ (CNG); 4 ♂, 5 ♀, vii.—.94, C. H. Roberts (AMNH); 1 ♂ (ANSP). *Chittenden County*.

Mt. Mansfield, Lake Cloud, 1, vi.29.15 (USNM). *Windsor County.* Woodstock, 1 ♂, vii, F. E. Winters (CAS). **VIRGINIA.** *Fairfax County.* Black Pond, 1, ix.24.15, Shoemaker (USNM). Falls Church, 2, viii.14.—, St. George & Craighead (USNM). Great Falls, 2, ix.9.06, D. H. Clemons (USNM); 2, J. D. Sherman, Jr. (USNM); 1, ix.23.15, Shoemaker (USNM). Mt. Vernon, 1, viii.1.19, Shoemaker (USNM). *Fauquier County.* 1, v.22.61, P. J. Spangler (USNM). *Giles County.* Mt. Lake, 1, viii.14.41, A. C. Cole (CAS). *Stafford County.* Fredericksburg, 3, iii.15.91; 1, ix.—.93; 1, x.1.93; 2, iii.29.99; 1, iv.27.—, Richardson (USNM). **WEST VIRGINIA.** Greenbriar, White Sulphur Springs, 4, vii.23.10, W. Robinson (USNM). *Hampshire County.* Romney (near), 1 ♂, vi.—.35 (CNG). *Jefferson County.* Harpers Ferry, 17, ix.12.17, J. E. Benedict, Jr. (USNM). *Mercer County.* Athens, 2, vi.16.30, J. G. Needham (CNL). *Preston County.* Terra Alta, 4, ix.28.30, J. G. Needham (CNL). *Summers County.* Talcott, 1 ♂, vi.5.35 (CNG). *Wetzel County.* Lake Floyd, 1, viii.12.50, P. J. Spangler (USNM). **WISCONSIN.** *Bayfield County.* Bayfield, 1 (USNM). *Dane County.* Madison, 1 ♀, viii.11.37 (MCHS); 1 ♂, vi.3.29 (FM); 20+, v.9.36, H. R. Dodge (CAS). *Jackson County.* Pigeon Falls, 8 ♂, 4 ♀, vi.15.52, P. J. Spangler (USNM). *Oneida County.* Three Lakes, 1 ♂, 3 ♀, W. S. Marshall (AMNH). *Sauk County.* Sauk City, 2 (USNM). *Shawano County.* Shawano County, 20+, vii.17.35, H. R. Dodge (CAS). *Vernon County.* Victory, 1, vii.29.27, F. M. Uhler (USNM). *Winnebago County.* Oshkosh, 1 ♂, vii.16.—, E. S. Ross (CAS).

Laccophilus maculosus decipiens LeConte, new status

(Figs. 34, 37, 278, 279)

Laccophilus decipiens LeConte, 1852, p. 205. *Type*: Museum of Comparative Zoology, number 5974, male; type locality here restricted to 2.8 miles east of La Grange, Vizard Creek, Stanislaus County, California; Crotch, 1873, p. 400; Sharp, 1882, p. 10; Horn, 1894, p. 313; Leech, 1948b, p. 402; LaRivers, 1951, pp. 397-8; Leech & Chandler, 1956, p. 314; Gordon & Post, 1965, p. 12.

Laccophilus truncatus Mannerheim, 1853, p. 160.

Laccophilus californicus Motschulsky, 1859, p. 172.

Laecophilus (sic!) *maculosus* Walker, 1866, p. 317.

Laccophilus fusculus Sharp, 1882a, p. 290.

DIAGNOSIS. — There are only three other irrorated *Laccophilus* that occur within the range of *L. m. decipiens* in western North America. All three, *L. mexicanus, L. fasciatus terminalis,* and *L. proximus,* are smaller than *decipiens.* Almost all *decipiens* exceed 5.2 mm which is a maximum length for any of those three. *L. proximus* which overlaps *decipiens* east of the Rocky Mountains, attains a length of only 4.6 mm. All males and most females of *L. mexicanus* have black on the venter instead of brown or reddish-brown as in *decipiens.* Some females of *mexicanus* from coastal California and Oregon have brown venters, however, and a careful comparison of size and elytral pat-

tern is necessary to separate the two species. *L. mexicanus* has a more uniformly irrorate pattern. *L. f. terminalis,* on the other hand, is less evenly irrorate than *decipiens* and has a checkered appearance when viewed megascopically. Some depigmented specimens are not checkered, but they are much paler than *decipiens.*

L. m. decipiens differs from *L. m. maculosus* in its larger size (5.1 to 6.4 mm as compared to 4.7 to 5.8 mm), more evenly irrorate pattern, and the structure of the aedeagus. It is quite similar to *L. m. shermani* in size, color and pattern (figs. 276-279), but differs in the more anterior position of the female epipleural flange, a finer coxal file (about 45 lines to 35), and in the aedeagus. It is flattened at the tip in *decipiens* and twisted with a sinus and incomplete hook at the tip in *shermani.*

NOMENCLATURAL NOTES. — The synonymy has been confirmed except for *truncatus* Mannerheim and *californicus* Motschulsky. Dr. F. N. Young has examined the female type of *fusculus* Sharp and has sent me a camera lucida drawing and there is nothing to distinguish it from numerous specimens of *decipiens.* It is probably not *shermani* Leech since the epipleura are not expanded; and Nevada, given as the type locality, seems to be entirely out of the range of that race. Since the description is based on a single female specimen and there is no precise locality, it is probably impossible to be certain. Motschulsky's *californicus* was taken at San Francisco, California, and could conceivably prove to be either *L. mexicanus atristernalis* Crotch or *L. fasciatus terminalis* Sharp. Crotch (1873) had, however, synonymized *truncatus* and *californicus* when he described *atristernalis* and presumably knew their identity. Mannerheim's *truncatus* was described from Alaska and the Pribilof Islands which is within the range of *biguttatus* Kirby and it is remotely possible that it could be a synonym of that frequently misidentified species. I have examined LeConte's type and compared it to a specimen collected by H. B. Leech from Stanislaus County, California, and could find no difference other than that of normal individual variation.

VARIATION. — Although exhibiting more variation than *L. m. maculosus, decipiens* has relatively little considering its enormous geographical range and ecological and topographic amplitude. Specimens from near the Coast and in Nevada, however, do appear to be darker with more suffusion of color between the dots and a more pronounced delineation of the marginal clear areas than those from the Rocky Mountains and Great Plains. The lateral spots may also be

smaller. Specimens from Wyoming appear faded when compared to coastal ones.

The mean length of males is about 5.8 mm and that of females about 5.6 mm, with an overlap of males and females of about 50 percent. This contrasts with *maculosus* in which about 75 percent or more of the males and females overlap. The variation among localities is slight and an analysis of variance for 240 males from eleven scattered localities for total length shows no significance at the 95 percent level.

The PW/EL ratio also shows a strong uniformity within *decipiens*. Mean values vary from 0.598 to 0.626 for eleven localities. The ratio does show, however, that *decipiens* in addition to being slightly larger than *m. maculosus,* is also relatively wider. The latter has mean values ranging from 0.580 to 0.600. The ratio is about the same for *L. m. shermani* as *decipiens,* but the former may be slightly narrower since there are five samples with values below 0.595 (none in *decipiens*).

An attempt was made to count the lines in the metacoxal file of specimens from different localities. There was no apparent geographical difference. The highest count was 50, and was found in both Wyoming and Oregon specimens and the lowest count was 40 in individuals from Utah and California. The average number was about 44. Only about five to ten percent of the females have epipleural flanges.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. —*L. m. decipiens* (fig. 3) ranges from northern Baja California to Alaska along the Pacific Coast. It extends eastward to Alberta and central Colorado. It intergrades with *shermani* along the northern edges of New Mexico, Arizona and into eastern Riverside County, California. There is a single specimen from Hale County in the northern panhandle of Texas. It occurs from sea level to 9000 feet. The principal difference between the habitats of *decipiens* and *maculosus* is that the former is found in or near coniferous forest instead of temperate deciduous forest. Practically any non-marine aquatic environment other than large lakes and streams provides suitable habitat for the adults.

MATERIAL EXAMINED

CANADA. — **ALBERTA.** Calgary, 1 ♂, 1 ♀, vii.4.53; 1 ♂, 1 ♀, iv.30.57; 1 ♂, 1 ♀, v.12.57; 1 ♂, xii.7.57, F. S. Carr (CARR); 10, x.16.27, O. Bryant

(CAS). Champion, 1 ♀, v.18.59, F. S. Carr (CARR). Cypress Hills, 1 ♀, vi.13.24; 1 ♀, v.13.28 (DAV). Edmonton, 1 ♀, v.1.26, F. S. Carr (DAV). Ft. McCleod, 3 ♂, 5 ♀, iii.18.56, F. S. Carr (CARR); 50+, ix.15.28, O. Bryant (CAS). High River, 1, ix.2.28, O. Bryant (CAS). Medicine Hat, 1 ♂, 1 ♀, x.12.58; 4, viii.25.23, F. S. Carr (CAS); 4, ix.3.23; 4, viii.7.26, Shoemaker (USNM). Pincher Ck., 2 ♀, viii.6.28 (DAV). Porcupine Hills, 1 ♀, x.18.59, F. S. Carr (CARR). **BRITISH COLUMBIA.** Bon Accord, 21, Hubbard & Schwarz (USNM). Creston, 2, ix.4.54, G. Stace Smith (CNL). Fernie, 10, ix.16.28, O. Bryant (CAS). Golden, 2 ♂, 1 ♀, 8.00.03, P. Gregson (AMNH). Kamloops, 2, ii.1.29, O. Bryant (CAS). Marysville, 1, vi.6.56, E. Fodor (CNL). Osoyoos, 1, iii.29.41, H. B. Leech (CAS). Victoria Is., Royal Oak, 2, v.19.56, E. Argyle (CNL). Victoria, 1, Wickham (USNM). Vernon, 4, v.1.29, R. Hopping (ISU). Windermere, 8, ix.17.28, O. Bryant (CAS). Wynndel, 10, viii.11.54, G. Stace Smith (CNL).

UNITED STATES OF AMERICA. — **ARIZONA.** *Mohave County.* Littlefield, 2 ♂, 1 ♀, ix.6.53, P. D. Ashlock (CAS); same date, 1 ♂, 1 ♀ (DAV). **CALIFORNIA.** *Alameda County.* Albany, 3, iii.16.21 (BERK). Berkeley, 3 ♂, 9 ♀, x.15.37, vi.7.37, J. J. Dubois (BERK); 5, x.4-25.19, H. Dietrich (BERK); 4 ♂, 2 ♀, xii.14.29, A. T. McClay (DAV); 2, iv.20.41, H. P. Chandler (BERK). Berkeley, Strawberry Pool, 3 ♂, iii.24.48, R. Johnston (BERK). Livermore, Arroyo Mucho, 2 ♂, x.7.56; 16 m. S., 1 ♀, x.7.56, J. Chemsak (BERK); 1 ♀, x.8.54, A. M. Barnes (BERK); 1 ♂, iii.24.64, W. W. Wade (CAS); 1 ♀, viii.7.29, A. T. McClay (DAV). *Alpine County.* Monitor Pass, 8300 feet, 1 ♀, viii.24.63, H. B. Leech (CAS). *Amador County.* Volcano Cn., 1 ♂, xi.3.57, R. E. Rice (DAV). *Calaveras County.* Altaville, 4.5 m. W., 1 ♂, viii.31.63, H. B. Leech (CAS). Mokelumne Hill, 1, vii.—.—, Blaisdell (CNL). *Contra Costa County.* Tilden Park, 2 ♀, x.27.48; 1 ♀, xi.9.48, R. Johnston, 1 ♂, xi.21.56, J. A. Chemsak (BERK). Vine Hill, 3, vi.20.10, Chamberlain (CNL); 1 ♂, vi.20.10, Chamberlain (AMNH). County, 1 ♂, vi.3.09, F. W. Nunenmacher (FM). *Eldorado County.* Camino, 3 m. S., 4 ♂, 6 ♀, vi.23.48, Carter, Myers, & Smith (BERK); 2 ♂, 2 ♀, same date, H. P. Chandler (DAV). Chile Bar, 3 ♂, 2 ♀, vii.5.48, H. P. Chandler (BERK). China Flat, 2 ♀, vii.15.48 (BERK). Echo Lake, 3, vii.13.32, E. O. Essig (BERK). Pollock Pines, 1 ♂, 2 ♀, vi.29.38; 1 ♀, vi.24.38; 1 ♂, vii.3.36; 1 ♂, 5 ♀, vi.23.39; 1 ♂, 1 ♀, vii.8.39; 1 ♂, viii.18.39; 1 ♂, vii.23.39; 1 ♀, ix.1.39; 1 ♂, 3 ♀, vii.8.48, A. T. McClay (DAV). Rubicon R. (near Georgetown), 1 ♀, vii.28.63, H. B. Leech (CAS). Tahoe, 1, vii.3.50, R. Schuster (BERK). County, 1 ♀, vi.8.06, F. W. Nunenmacher (FM). *Del Norte County.* Smith R. at Hwy. 101, 1 ♂, ix.29.65, H. B. Leech (CAS). *Fresno County.* Fresno, 1, v.30.—, F. A. Schwarz (USNM). Wartham Ck., near Parkfield, 1 ♂, xi.30.63, H. B. Leech (CAS). *Humboldt County.* Ferndale, 1, ix.14.46, H. P. Chandler (BERK). Bull Ck. at Cuneo Ck., 1 ♀, x.2.65, H. B. Leech (CAS). *Inyo County.* Deep Springs, 1 ♂, vi.19.54, P. Raven (CAS). Keeler, 1, vii.6-14.—, Wickham (USNM). Lone Pine, Owens Valley, 1, iv.20.31, Blackwelder (USNM); 1 ♂, 2 ♀, v.20.37, J. J. Dubois (BERK). Olancha (?) 1, J. D.

Sherman, Jr. (USNM). *Kern County*. Red Canyon, 1 ♀, vi.10.22 (AMNH). *Lake County*. Thurston Lake, 1, H. P. Chandler (BERK). *Lassen County*. Eagle Lake, 1, ix.19.46, H. P. Chandler (BERK). Hallelujah-Jct., 1 ♀, vii.4.49, J. W. McSwain (BERK); 1 ♂, 1 ♀, vii.4.49, H. A. Hunt (DAV). Madeline, 1, vii.12.25 (USNM). Poison L., 1 ♂, vi.13.41, C. W. Anderson (BERK). Susanville, 1, viii.1.32, Blackwelder (USNM). Willow Ck., 1 ♂, 1 ♀, ix.9.58, Allyn Smith (CAS). *Los Angeles County*. Claremont, 6 ♂, 7 ♀, Baker (CNG). Lancaster, 3 m. N., 8, iv.3.53, R. K. Benjamin (USNM). Los Angeles, 5, vii.—.—, W. D. Richardson (USNM); 13, Coquillett (USNM); 1, ii.—.19, R. P. Dow (USNM). Palmdale, 1 ♀, vi.18.44, G. P. Mackenzie (LACM). Pasadena, 2 ♂, 1 ♀, vi.27.16; 1 ♀, v.29.20 (AMNH). Pine Can., Hidden L., 1 ♂, 1 ♀, ii.15.53; 1 ♂, iii.21.53, Menke & Truxal (DAV). Pomona, 4, J. D. Sherman, Jr. (USNM). San Franquito Can., 4 ♂, ii.29.53; 1 ♂, 1 ♀, iii.30.53; 2 ♂, 1 ♀, iv.1.53; 1 ♂, iv.3.53, L. A. Stange (DAV). Soledad Can., 1 ♂, i.10.54, Menke & Sullivan (DAV). Tanbark Flat, 1 ♀, vii.13.50 (BERK). *Madera County*. Chilkoot L., Jackass Mtns., 4 ♂, 2 ♀, vii.23-31.46, H. P. Chandler (NMSU). Chowcilla, 18 m. E., 1 ♂, ii.2.64, H. B. Leech (CAS). Coarsegold, 1 ♂, 1 ♀, H. P. Chandler (BERK). O'Neal's, 1 ♂, iii.10.46, H. S. Fitch (DAV). Windy Gap. 1, vii. 13.46, H. P. Chandler (CAS). *Marin County*. Dillon Beach, 1 ♀, vi.24.63, H. B. Leech (CAS). Inverness, 2 ♂, 1 ♀, vii.20.50 (BERK). Pt. Reyes Sta., 2 ♂, x.1.60, J. S. Buckett (DAV). Ross Valley, 1 ♀, ix.2.06, E. C. Van Dyke (AMNH). County, 2, J. D. Sherman, Jr. (USNM). *Mariposa County*. Miami Rngr. Sta., 1 ♀, vi.7.42, H. P. Chandler (FM). Yosemite, 1 ♂, 1 ♀, vii.17.48, B. Adelson (BERK); 1 ♀, v.24.64, W. W. Wade (CAS). *Mendocino County*. 1, v.31.17, E. R. Leach (USNM). Albion, 1 m. S., 1 ♂, vii.1.63, H. B. Leech (CAS). *Modoc County*. Cedarville, 5 m. E., 1 ♀, vi.5.60, J. Schuh (SCH). Juniper Flat, 1 ♂, vi.10.39, J. J. Dubois (BERK). *Mono County*. Bodie, 8500 feet, 1 ♀, viii.13.62, H. B. Leech (CAS). Bridgeport, Travertine Hot Springs, 2 m. S.E., 6700 feet, 1 ♂, 1 ♀, viii.11.62, H. B. Leech (CAS). Inyo Craters Lake, 8280 feet, 1 ♂, viii.17.62, H. B. Leech (CAS). June Lake, 1 ♂, 5 ♀, ix.8-9.45, G. P. Mackenzie (LACM). Leavitt Meadows, 7200 feet, 1 ♂, viii.10.62, H. B. Leech (CAS). Mammoth (Lakes?), 4 ♂, 5 ♀, ix.15.45, G. P. Mackenzie (LACM). Twin Lakes, 1, vi.14.31, Blackwelder (USNM). *Monterey County*. Bryson, 2 ♀, iv.9.63, D. C. Rentz & K. A. Hale (CAS). Parkfield, 1 ♀, xi.20.63, H. B. Leech (CAS). Salina(s?), R., 3, vii.17.25 (USNM). *Napa County*. Monticello, Putah Ck., 2, xii.17.—, J. C. Bradley (CNL); 1 ♂, vii.22.30, A. T. McClay (DAV); 2 ♂, 3 ♀, iii.30.31 (DAV). *Nevada County*. Hobart Mills, 1, H. D. Chandler (BERK). Sagehen Ck., 1 ♂, 1 ♀, x.15.55, J. L. Herring (BERK). Webber L., 1 ♂, viii.22.64, E. S. Ball (SCH). *Orange County*. Costa Mesa, 1 ♂, 2 ♀, iv.19.58, M. E. Irwin (DAV). Laguna Beach, 3, viii.25-26.— (CNL); 1, vii.—.21, C. T. Dodds (BERK). Laguna Can., 2 ♂, xii.29.58, M. E. Irwin (DAV). *Placer County*. Tahoe, 14, vii.—.— (USNM); 14, vii.6.09, J. D. Sherman, Jr. (USNM); 4 ♂, 6 ♀, vii.—.— (AMNH). *Plumas County*. Almanor Dam, 1 m. N.W., 2 ♂, 2 ♀, vii.17.47, C. H. Spitzer (CAS). Buck's Lake, 1 ♂, 1 ♀, vii.14.49, E. I. Schlinger (DAV). Chester,

1 ♀, vii.29.61, H. B. Leech (CAS). Clio, 1 ♀, viii.28.61, H. B. Leech (CAS). Quincy, 4 m. W., 3 ♂, 4 ♀, vii.13.49, W. H. Wade (BERK); 1 ♂, 3 ♀, vii.6.49, L. W. Isaak (DAV). *Riverside County.* Camp Pendleton, 2, x.7.45, H. P. Chandler (BERK). Riverside, 3 ♂, 2 ♀, F. E. Winters (CAS); 6, viii.16.37, Drake & Andre (USNM); 14, F. E. Winters (CNL). San Jacinto Mtns, 1 ♂, 2 ♀, —.—.32, F. E. Winters (CAS). San Jacinto Mtns., Keen Camp, 1 ♀, R. F. Smith (FM). *Sacramento County.* Folsom, 1 ♀, iv.5.47, A. T. McClay (DAV). Franklin, 1, iii.10.21, C. M. Packard (USNM). Sacramento, v.7.41, A. T. McClay (DAV); 1 ♀, ii.—.20, H. F. Robinson (DAV). *San Bernardino County.* Afton Canyon, 4, iv.18.31, Blackwelder (USNM). Barstow, 1 ♂ (NMSU); 2 ♂, 2 ♀ (AMNH); 7, viii.19.88 (ISU). Barton Flats, 2 ♀, x.4.58, M. E. Irwin (DAV). Colton, 1 (USNM). Cottonwood Sprgs., 7 ♂, 7 ♀, iv.5.48, MacSwain & Smith (BERK). Hesperia, 1 ♂, iv.7.39, G. P. MacKenzie (AMNH). Mtn. Pass, 1 ♂, iv.11.42, O. Bryant (CAS). Sweetwater (Sprgs.?), 1, vi.2.—, Dyar & Candell (USNM). *San Benito County.* Gonzales, 16 m. E., 2 ♀, iii.30.63, D. Reutz & K. Hale (CAS). *San Diego County.* Anza-Borrego St. Pk., 1, iv.—.53, A. & H. Dietrich (CNL). Banner, 6 m. E., 1 ♂, vi.26.63, J. D. Birchim (CAS). Borrego (Sprgs.?), 1 ♂, iv.12.50, W. F. Barr (FM). Campo, 1 ♀, iv.13.65, H. B. Leech (CAS). Descanso, 4 ♂, 1 ♀, ix.23.52, 1, viii.7.14, J. C. Bradley (CNL). Escondido, 10 m. N., 5, xii.17.54; 12 m. N., 1, xi.20.53; 12 m. N., 1 ♀, iv.17.63, R. K. Benjamin (USNM). Glenncliff Cp. (near Buckman Sprgs.), 3 ♂, 5 ♀, ix.21.54, Menke & Stange (DAV). Laguna Mtns., near Buckman Sprgs., 2 ♂, 1 ♀, v.6.53, F. X. Williams (CAS). Mt. Palomar, 1 ♂, vi.21.59, M. E. Irwin (DAV); 2, x.21.45, H. P. Chandler (BERK). Oceanside, Camp Pendleton, 1 ♀, x.7.45, H. P. Chandler (FM). San Diego, 1, Mann (USNM); 1, G. H. Field (USNM); 2 (USNM); 2, iv.8.54, R. Straw (USNM). San Felipe Ck., 4 m. N., Scissors Crossing, 2 ♀, iv.15.65, H. B. Leech (CAS). Sentenas Cn., 1 ♀, 1,26.56, Menke & Strange (DAV). Warner's (Springs), 1 ♀, viii.19.25 (MCZ). County, 1 ♀ (FM). *San Mateo County.* San Francisco Bay Marsh, Redwood City, 1 ♀, x.1.50, PSB (CAS). Woodside, Pulgas Temple, 4 ♂, 10 ♀, vi.10.51, PSB; 5 ♂, 3 ♀, xi.4.51, PSB; 2 ♀, vi.23.52; 1 ♀, xi.25.54, PSB (CAS). *Santa Barbara County.* Los Prietos, 4 m. E., 1 ♂, vi.26.65, M. R. Gardner (DAV). Santa Barbara, 1, iv.—.—, F. E. Winters (CNL); 4 ♂, 3 ♀, F. E. Winters (CAS). *Santa Clara County.* Palo Alto, 2, ii.2.26, Blackwelder (USNM); 1 ♀, vi.6.92, V. L. Kellog (FM); 1, v.19.40, H. P. Chandler (BERK). Palo Alto, Stanford U., 6 ♂, 1 ♀, ix.12.09, W. M. Mann (USNM). San Antonio Val., 2, iii.2.48, J. W. MacSwain (BERK). San Jose, 1, Hubbard & Schwarz (USNM). County, 1; 2 ♂, 2 ♀, C. F. Baker (USNM). *Shasta County.* Hat. L., 1 ♂, vii.11.47, R. L. Usinger (BERK); 1 ♀, vii.11.47, E. E. Seibert (CAS); Hat Ck., P.O., 1 ♀, vi.27.55, A. J. Mueller (DAV). Lake Britton, 1 ♂, vi.29.47, C. H. Spitzer (CAS). Manzanita L., 5800 feet, 2 ♂, 3 ♀, x.1.44, B. Malkin (FM); Manzanita L., Lassen Nt. Pk., 1 ♀, C. W. Anderson (BERK). Old Station, 1 ♂, 1 ♀, vi.26.47, E. E. Seibert (BERK). Viola, 4 m. W., 2 ♂, vi.27.47, E. E. Seibert (BERK). *Sierra County.* Sattley, 4 ♂, 3 ♀, vii.11.62,

R. L. Westcott (FM); 3 ♂, 5 ♀, vii.11.62, Gill & Montgomery (DAV). Snag Lake, 2 ♂, 3 ♀, vii.5.64, J. E. Slansky (DAV). *Siskiyou County*. Grass Lake, 5000 feet, 1 ♂, vii.4.52, M. Cozier, W. Gertsch, R. Schrammel (AMNH). Indian Tom L., 2 ♂, 2 ♀, ix.27.66, J. Schuh (SCH). Lower Klamath L., 4 ♀, vi.1.57; 1 ♂, vi.6.66, J. Schuh (SCH). Montague, 10 m. S.E., 1 ♂, viii.27.64; 10 m. N.E., 1 ♀, viii.27.64, J. Schuh (SCH). Mt. Hebron, 5 m. S., Butte Ck., 1 ♂, 3 ♀, v.1.66, J. Schuh (SCH). Weed, 4 m. S., 1 ♀, viii.12.58, J. Howell (NMSU). Willow Ck., 1 ♀, vii.14.55, J. Schuh (MCHS); 1, ix.3.59, J. Schuh (SCH); Willow Ck., Jewell Sprg., 1 ♀, ix.22.62, J. Schuh (SCH). *Stanislaus County*. La Grange, 2.8 m. E., 2 ♂, 1 ♀, viii.14.62, H. B. Leech (CAS). *Sonoma County*. Guerneville, 1, v.20.08, E. C. Van Dyke (USNM). Santa Rosa, 2 (CNL). *Solano County*. Rio Vista, 1, iii.26.21, C. M. Packard (USNM). Vacaville, 1 ♂, iv.15.43; 1 ♀, iv.8.49, A. T. McClay (DAV). *Trinity County*. County, 1, ix.16.—, E. R. Leach (USNM); 1 ♂, viii.22.29, E. R. Leech (CNG). *Tulare County*. Camp Potwisha, 4, vii.16.31, E. C. Zimmerman (USNM). Kaweah, 4, Hopping (USNM). Porterville, 1 ♀, viii.19.62, E. E. Ball (SCH). Sequoia Ntl. Pk., 1 ♂, v.28.29; 1 ♀, v.19.30, A. T. McClay (DAV). Three Rivers, 1, vii.12-14.07 (CNL). *Tuolumne County*. Leland Mdw., 1 ♂, 1 ♀, viii.21.60, D. Q. Garagnaro (DAV). Near Knights Ferry, 1 ♂, ix.22.63, H. B. Leech (CAS). Priest, 4.2 m. S.E., 1 ♂, viii.19.62, H. B. Leech (CAS). *Ventura County*. Chuchupate Rgr. Sta., Frazier Mtn., 1 ♀, v.2.59, C. W. O'Brien (BERK). Ojai, 1 ♂, vii.—.54, T. Barnes (LACM). *Yolo County*. Davis, 1, iv.—.49 (USNM); 1 ♂, ix.12.4, H. R. Cameron (ORES); 1 ♀, iii.28.49, E. I. Schlinger; 1 ♀, iii.5.50, M. E. Taylor; 1 ♂, iv.18.59; 1 ♂, x.23.59, M. E. Irwin; 2 ♂, x.15.60; 1 ♀, ix.24.60, D. Q. Caragnaro; 6 ♂, vi.26.61, V. L. Vesterby (DAV). Putah Cn., 1 ♀, iv.15.52, A. A. Grlgarick (DAV). **COLORADO.** *Alamosa County*. 1 ♂, vi.14.30; 1 ♂, 1 ♀, vii.2.30, S. C. Bishop (NMSU); 1 ♂, iii.7.—, F. C. Bowditch (MCZ). Hooper, 9-10 m. E., San Luis Lakes, 2 ♂, 4 ♀, viii.13.65, H. B. Leech (CAS). *Archuleta County*. Piedra, 3 ♂, vii.19.52, B. Malkin (FM). *Chaffee County*. Buena Vista, 1, vii.6.96, Wickham (USNM). *Conejos County*. Conejos R. at Hwy. 17, 1 ♂, 1 ♀, viii.12.65, H. B. Leech (CAS). N. Fork, Los Pinos R., at Hwy. 17, 1 ♂, viii.12.65, H. B. Leech (CAS). *Denver County*. Denver, 1, vi.25.— (CNL); 10, x.—.35, A. Thrupp (CAS); 4 ♂, 2 ♀, vii.19.— (MCZ). *Garfield County*. Glenwood Springs, 2 ♀, viii.—.— (MCZ). *Gunnison County*, 6, J. D. Sherman, Jr. (USNM). Gunnison, 1, ix.19.33, E. A. Andrews (CAS). County, 7500 feet, 1 ♂, 1 ♀, vi.26-30.85, F. C. Bowditch (MCZ). *Saguache County*. Mineral Hot Springs, 1 ♂, 2 ♀, viii.13.65, H. B. Leech (CAS). Saguache, 24 ♂, 15 ♀, viii.18.52, B. Malkin & V.E.T. (FM); 10.5 m. N.W., 1 ♂, viii.12.65, H. B. Leech; 12.5 m. N.W., 1 ♂, viii.12.65, H. B. Leech (CAS). *Weld County*. Greeley, 1, Wickham (USNM). *Adams County*. Mesa, 2 m. N. (Hwy. 95), 1 ♀, vii.20.6?, R. D. Anderson (RDA). *Bear Lake County*. Paris (near), 1, vii.10.35 (CNG). **IDAHO.** *Bingham County*, 1, vii.24.—, Hubbard & Schwarz (USNM). *Blaine County*. Clarendon Hot Springs, 5 ♂, 2 ♀, vii.22.52, B. Malkin (FM). *Bonneville County*. Idaho Falls, 1 ♂, 2 ♀ (CNG). *Elmore County*. Mountain Home, 1, vii.17.34, Lanchester (CAS).

Latah County. Moscow Mtn., 1, vii.20.38, H. M. Harris (ISU). Troy, 1, vii.16.38, H. M. Harris (ISU). *Nez Perce County*. Lenore, 1000 feet, 1 ♂, iv.1.51, W. F. Barr (FM). *Oneida County*. Malad City, 5 m. W., L. Malad R., 1 ♂, 3 ♀, vii.13.52, B. Malkin (FM). *Owyhee County*. Hot Springs, 1 ♀, vii.4.51, W. F. Barr (FM). *Twin Falls County*. Rogerson, 11 m. E., 2 ♀, vii.20.52, B. Malkin (FM). **MONTANA.** *Dawson County*. Glendive, 1, Wickham (USNM). *Flathead County*. Kalispell, 1, Wickham (USNM). *Glacier County*. Cutbank, 2 ♂, 1 ♀, viii.22.54, P.S.B. (CAS). *Jefferson County*. 1 ♂, vii.27.25 (USNM). *Ravalli County*. Corvallis, 2 ♀, v.20.52, A. A. Hubert (USNM). *Sanders County*. Thompson Falls, 1 ♂, 1 ♀, vii.22-23.50, B. Malkin (FM); 1, vii.22-23.50, B. Malkin (CAS). **NEVADA.** *Elko County*. Carlin, 2, vii.26.12 (USNM); 1, vii.17.12 (CNL). Lamoille Cn., 8 ♂, 24 ♀, vi.14.58, F. D. Parker (DAV). *Lincoln County*. Hiko, Tonapah Jct., 1 ♂, vii.25.63, P.S.B. (CAS). *Nye County*. Ash Meadows, 1 ♂, 1 ♀, iii.30.66, J. Schuh (SCH). Beatty, 2 m. N., 1 ♂, iii.29.66; 3 m. N. Amargosa R., 3 ♀, iii.29.66, J. Schuh (SCH). Warm Springs, 6 ♂, 5 ♀, vii.25.63, P.S.B. (CAS). *Ormsby County*. Carson City, 3, vii.30.—, Wickham (USNM). *Washoe County*. IXL Ranch, 2 ♀, vii.—.51, N. Pasquale (ORES). Reno, 1 ♂, 1 ♀ (AMNH); 2 ♀, i.2.57, F. Parker (DAV); 1 ♂, Wickham (ANSP); 1, Wickham (USNM). **OREGON.** *Benton County*. Buchanon, 4 ♂, 5 ♀, ix.10.49, V. Roth (ORES). Corvallis, 1 ♀, viii.13.35; 1 ♀, x.18.35, G. Ferguson (ORES); 3 ♀, xi.2.06 (ORES); 1 ♀, x.28.06, Wood (ORES); 2 ♂, 1 ♀, xi.1.08, Hays, Sprague & Reynolds (ORES); 3 ♀, vi.23.—; vii.4.09, iv.5.36 (ORES); 1 ♀, iii.30.30, R. L. West (ORES); 2 ♂, 3 ♀, x.24.—, xi.3.33, J. Schuh (ORES); 1 ♂, v.26.35, I. Tarshis (ORES); 2 ♂, 2 ♀, iii.7-16.36, N. D. Larsen (ORES); 1 ♀, iv.10.38, S. Jewett (ORES). Corvallis, Oak Ck., 1 ♂, 1 ♀, v.—.39, G. G. Black (ORES). Corvallis, Colorado L., 4 ♀, iv.7.30, L. Seghetti (ORES). 3, iv.22.09, G. F. Moznette (CNL); 3 (USNM); 5, iv.25.—, J. D. Sherman, Jr. (USNM); 44, J. D. Sherman, Jr. (USNM); 21, 1, iv.28.01, J. D. Sherman, Jr. (USNM); 8, vi.24.09, J. D. Sherman, Jr. (USNM); 17 ♂, 24 ♀, iv.27.—, 14 ♂, 11 ♀, vi.24.—; 10 ♂, 1 ♀, vii.18.—; 4 ♂, 3 ♀, ix.20.—; A. R. Woodcock (AMNH). Summit Prairie, 4 ♂, 6 ♀, viii.9.39, Gray & Schuh (ORES). Yew Ck., near Mt. Alsea, 2 ♂, v.25.45, G. L. Bennett (ORES). *Coos County*. Coos Bay, 1 ♂, 1 ♀, vii.9-10.51, B. Malkin (FM). *Curry County*. Pistol R., 6 ♂, 6 ♀, ix.18.50; 1 ♂, vii.7.51, B. Malkin (FM); 1, vii.7.51 (CAS). *Deschutes County*. Bend, 4, vii.23.32, R. Blackwelder (USNM). Bend, 20 m. S., 2 ♂, 7 ♀, iii.8.39, Gray & Schuh (ORES). Near Tumalo, Deschutes R., 3 ♂, 3 ♀, iii.22.39, Gray & Schuh (ORES). *Douglas County*. Gardiner, 8 m. E., Otter Slough, 2 ♀, vi.1.66, J. Schuh & J. Vertrees (SCH). *Grant County*. Kimberly, 15 m. S., 2 ♂, vii.1.60, J. D. Lattin (ORES). Silvies Valley, 2 ♂, iv.28.57, J. Schuh (SCH). *Harney County*. Blitzen Valley, 1 ♂, 4 ♀, viii.1.36, S. Jewett (ORES). Buena Vista, 1 ♂, v.19.56, J. D. Lattin (ORES). Burns, 25 m. E., 2 ♂, viii.21.45, H. A. Scullen (ORES). Burns, 15 m. S., 1 ♂, vii.13.53, Roth & Beer (ORES). Burns, 3 ♂, 5 ♀, vi.21.51, B. Malkin (FM). Malheur, L., 1 ♂, vi.20-21.51, B. Malkin (FM). Malheur Wldlf. Ref., 1 ♂, viii.15.62

(MCHS). *Jackson County*. Trail, 1 ♂, 2♀, ix.9.50, Malkin & Thatcher (FM); 1, ix.9.50 (CAS). Medford, 3 ♂, 3 ♀, iv.1.39, F. Lawrence (DAV). *Josephine County*. Grants Pass, 1 ♂, vii.3.06, Eismann (ORES). Rogue River, 1, ix.8.02, Biederman (USNM). County, 1 ♀, vi.6.34, F. W. Nunenmacher (FM). *Klamath County*. Aspen L., 3 ♂, 3 ♀, v.5.57, J. Smith (SCH). Bly, 5 m. E., 4 ♂, v.5.62, R. Scott & J. Schuh. Bly Mt., 2 ♂, 4 ♀, ix.15.60, J. Schuh (SCH). Chiloquin, 12 m. E., Sprague R., 1 ♂, 3 ♀, vii.1-3.51, B. Malkin (FM). Chiloquin, 7 m. N., Williamson R., 1 ♂, 2 ♀, ix.23.66; 6 m. E., 1 ♂, 1 ♀, ix.21.65, J. Schuh (SCH). Crescent, 4 ♂, 5 ♀, ix.10.50, B. Malkin (FM); 1 ♀, v.12.57; 1 ♀, J. Schuh (SCH); 2 m. N.E., 2 ♀, v.13.66; 11 m. N.E., 1 ♀, v.13.66, J. Schuh; 13 m. S.E. Bly, 1 ♀, iv.26.62, Vertrees & Schuh (SCH). Ft. Klamath, 5 ♂, 3 ♀, viii.10.50, B. Malkin (FM). Klamath Falls, 10 m. N.W., 1 ♂, vi.16.52 (ORES); 1 ♂, iv.22.57; 1 ♂, v.2.57; 1 ♂, iv.23.53; 1 ♀, v.31.48, J. Schuh (ORES); Modoc Pt., 1 ♀, vi.1.55, Schuh (ORES); Poe Valley, 1 ♀, v.27.55, Schuh (ORES); 5 ♂, 2 ♀, ix.3.50, B. Malkin (FM). Klamath (?), 1, G. M. Greene (USNM). Mare's Egg Spring, 3 ♂, ix.7.59, J. Schuh (SCH). Midlland, 3 m. S., 20 ♂, 13 ♀, ix.3.50, B. Malkin (FM). Poe Valley, 4 ♂, v.13.66, J. Schuh (SCH). *Lake County*. Abert L., 1 ♂, 3 ♀, vi.7.58, Vertrees & Schuh (SCH). Chandler St. Pk., 4 ♂, vi.29-30.51, B. Malkin (FM). Near Valley Fall, Chewaucan R., 1 ♂, 1 ♀, vi.7.55, J. Schuh (ORES); 1 ♂, 11 ♀, iii.16.39, Schuh & Gray (ORES). Lakeview, 1 ♀, vi.27-28.51, B. Malkin (FM); 1 ♂, vi.—.58, J. Schuh (SCH). Silver L., 10 m. N., 3 ♀, v.12.57, J. Schuh (SCH). Summer L., 1 ♀, v.18.57, J. D. Lattin (ORES). *Lane County*. Eugene, 2 ♀, vi.26.41; 2 ♀, viii.2.41; 1 ♂, 1 ♀, iv.5.42; 2 ♀, iv.11.42; 2 ♂, vii.13-14.51, B. Malkin (FM). *Linn County*. Albany, 1, vi.15-28.—, Wickham (USNM). Tangent, 2 ♂, 3 ♀, v.4.38, Edman (ORES). *Malheur County*. Drewsey, 4 m. E., 1 ♂, 1 ♀, ix.10.64, J. Schuh & W. Peters (SCH). *Multnomah County*. Gaston, 4, J. D. Sherman, Jr. (USNM). Portland, 1, J. D. Sherman, Jr. (USNM). *Wasco County*. Simnasho Hot Springs, 14 m. S., 1 ♂, v.22.59, J. D. Lattin (ORES). *Washington County*. Forest Grove, 1 ♂, x.—.06, J. C. Birdwell (ORES). *Yamhill County*. McMinnville, 1 ♂, vii.—.36, K. Fender (FM); 1 ♂, v.—.38, K. M. & B. M. Fender (LACM). **TEXAS**. *Hale County*. Plainview, 1 ♂, vii.14.54, F. C. Harmston (RDA). **UTAH**. *Boxelder County*. Rabbit Sp. Reservoir, 1 ♂, 1 ♀, vii.2.59, R. D. Anderson (RDA). Showville, 1 ♂, 1 ♀, viii.1.59, R. D. Anderson (RDA). *Cache County*. Benson, Logan Meadows, 13, viii.7.52, Knowlton & Wood (USNM). Wasatch Range, Beaver Mtn., 7700 feet, 1 ♂, vii.6.52, B. Malkin (FM). *Juab County*. Callao, 1 ♂, 1 ♀, xii.27.57, R. D. Anderson (RDA). Sevier R., at Hwy. 91, 1 ♂, 1 ♀, vi.11.59, G. Musser (RDA). *Kane County*. Zion Ntl. Pk., 2 m. E., 2 ♀, vi.21.59, R. D. Anderson (RDA). *Piute County*. Greenwich, 5 m. S., 1 ♀, viii.3.64, H. B. Leech (CAS). *Rich County*. Bear L., 1 ♂, vii.4.59, R. D. Anderson (RDA). *Salt Lake County*. Saltair, 1, vi.15.41, H. P. Chandler (CAS). Salt Lake, 1, iv.7.—; vi.13.—, Hubbard & Schwarz (USNM). Salt Lake City, 1 ♀, vii.14.52, B. Malkin & S. Mulaik (FM). Salt Lake City, Jordan R., 3 ♂, 1 ♀, iii.19.58; 2 ♂, 1 ♀, iv.20.57, R. D. Anderson (RDA). *Summit County*. Kimball Jct., 3 m. W., 1 ♀, v.12.57,

R. D. Anderson (RDA). Pineview, 1 m. E., 1 ♀, vii.2.59, R. D. Anderson (RDA). *Tooele County*. Mills, 3 m. S., 2 ♂, 3 ♀, v.2.58, R. D. Anderson (RDA). *Unita County*. County, 2 ♀, G. E. Wallace (CNG). *Utah County*. Goshen, 1 m. W., 2 ♂, iv.27.58, R. D. Anderson (RDA). Provo, 6, x.10.36, H. P. Chandler (CAS). Utah L., 13, vi.10.—, Hubbard & Schwarz (USNM); 1 ♂, vi.19.— (ANSP). Utah L., American Fork, 1 ♀, iv.23.58, R. D. Anderson (RDA). *Washington County*. Hurricane, 1 ♀, vi.22.59, R. D. Anderson (RDA). Near Central, Santa Clara Ck., 2 ♂, 2 ♀, v.10.58, R. D. Anderson (RDA). New Harmony, 1 ♂, 3 ♀, x.11.64, R. D. Anderson (RDA). St. George, 1, vii.—.—, Wickham (USNM); 12, A. M. Woodbury (USNM); 2 ♂, 5 ♀, iv.—.25 (USNM); 1 m. W., 3 ♂, 3 ♀, xii.29.59, G. Musser (RDA). Virgin R., 1 ♂, 2 ♀, G. Weldt (AMNH). *Weber County*. Ogden, 8, vii.3.—, Hubbard & Schwarz (USNM). **WASHINGTON.** *Adams County*. Ritzville, 4, viii.29.24, D. Dunavan (USNM); 2, viii.10.21, M. C. Lane (CAS). *Benton County*. Pasco, 4 ♂, iii.26.60, J. Shepard (ORES). *Chelan County*. Leavenworth, 8, v.29.42, J. G. Needham (CNL). *Douglas County*. Stratford, 2, ix.3.20, M. C. Lane (USNM). *Grant County*. Vantage, E. Side Columbia R., 2 ♀, vii.—.53, Crabtree (FM). *Jefferson County*. Pt. Townsend, 1 ♂, 1 ♀ (AMNH). *King County*. Issoquady, 1 ♂, ii.5.41, H. J. Jensen (BERK). Seattle, 1, iv.3.72 (CNL). Skykomish R., 1, vi.1.92 (USNM). Seattle, 1 ♀, iv.19.45, H. J. Jensen (BERK); 1 ♀, v.12.— (ANSP). *Kitsap County*. Winslow, 1, ix.10.—, Wickham (USNM). *Kittitas County*. Ellensburg, 1 ♀, ix.26.54, B. Malkin (FM). Vantage, 8 m. N., Whiskey Dick Can., 1 ♀, viii.4.54, B. Malkin (FM). *Okonagan County*. Okonagan, 4, iv.25.29, M. D. Leonard (CNL). *Pierce County*. Buckley, 1, v.28.42, J. G. Needham (CNL). Ft. Lewis, 24, vii.7.51, R. Schuster (BERK). *Snohomish County*. Chase Lake, 7 ♂, 7 ♀, viii.23.54; 2 ♂, 1 ♀, ix.25.52; 1 ♂, 1 ♀, v.4.52; 1 ♂, 1 ♀, x.17.54, B. Malkin (FM). Sultan, 1 ♂, 1 ♀, vi.1.53, B. Malkin & D. Boddy (FM). *Walla Walla County*. College Place, 1 ♂, v.2.45, W. Blehm (MCHS). Walla Walla, 1 ♂, ix.2.26, M. W. Stone (ORES). *Whitman County*. Pullman, 3, viii.17.01, C. Y. Piper (USNM); 1, vi.20.40, C. Yocum (ISU). *Yakima County*. Toppenish, 1, iii.20.25; 2, vii.20-27.24, D. Dunavan (USNM). *Washington County*. Terry, 50, Morrison (USNM). East Washington, 2, C. V. Piper (USNM). **WYOMING.** *Albany County*. Rock Creek, 1, viii.24.41, H. P. Chandler (CAS). *Converse County*. Douglas, 4.5 m. W., 1 ♂, 1 ♀, vii.27.64, H. B. Leech (CAS). *Crook County*. Devils Tower N. M., 4 m. S., 5 ♂, 6 ♀, viii.4.52, B. Malkin (FM). *Goshen County*. Ft. Laramie, Laramie R., 1 ♂, 4 ♀, vii.29.64, H. B. Leech (CAS). Ft. Laramie, Natl. His. Site, 1 ♂, 1 ♀, viii.19.65, H. B. Leech (CAS). Ft. Laramie, 5.3 m. E., 3 ♀, viii.18.65, H. B. Leech; Jay Jay Em, 2.5 m. N., 3 ♀, viii.20.65, H. B. Leech (CAS). Lingle, 3.8 m. E., 1 ♂, viii.19.65, H. B. Leech (CAS). *Johnson County*. Crazy Woman Ck., S. Fork, 1 ♂,2 ♀, vii.26.64, H. B. Leech (CAS). *Laramie County*. Cheyenne, 12.5 m. N.E., Lodgepole Ck., 3 ♂, 2 ♀, viii.18.65, H. B. Leech (CAS). *Natrona County*. Natrona, 2.5 m. S.E., 1 ♀, viii.20.65, H. B. Leech (CAS). Midwest, 8.5 m. N.W., Duquot Ck., 1 ♂, 2 ♀, vii.27.64, H. B.

Leech (CAS). *Niobrara County*. Manville, 3 m. W., 2 ♂, viii.20.65, H. B. Leech (CAS). *Platte County*. Glendo, 2 m. S., Horseshoe Ck., 1 ♂, 2 ♀, vii.29.64, H. B. Leech (CAS). *Sweetwater County*. Farson, 1 ♂, viii.22.65, H. B. Leech (CAS). Green River, 1 ♂, 1933, Wickham (USNM). Rock Springs, 10 m. W., 1 ♂, viii.23.65, H. B. Leech (CAS).

MEXICO. — **BAJA CALIFORNIA.** La Suerte, 2 ♂, vi.4.63, R. K. Benjamin (CAS); on southern slope of Sierra San Pedro Martir, Hamilton Ranch, 8 m. upstream near Colonia Guerro, 1 ♀, iv.23.63, H. B. Leech (CAS). San Felipe, 1, J. R. Sherman, Jr. (USNM). Tijuana, 45 km. S., 1 ♂, 1 ♀, viii.21.53, L. A. Stange (DAV).

Laccophilus maculosus shermani Leech, new status

(Figs. 35, 36, 276, 277)

Laccophilus shermani Leech, 1944, pp. 4-6. *Holotype*: male; Bear Canyon, Santa Catalina Mountains, Pima County, Arizona; iv.2.38, E. C. Van Dyke, Canadian National Collection, Ottawa.

DIAGNOSIS. — *L. m. shermani* belongs to the irrorated species with saw-like ovipositors and metacoxal files. The venter is yellow to reddish-brown, and the elytral pattern is relatively uniformly irrorate except for maculae. *L. mistecus aztecus,* which occurs in central Mexico, has much the same color and pattern, but differs in aedeagus, its larger size (0.2 mm longer), and lack of female epipleural flange. *L. fasciatus* subspecies are smaller (see diagnosis for *decipiens*) and have black markings on the posterior half of the elytra. *L. fuscipennis* is evenly irrorate and characteristically has a flange, but lacks clear maculae on the elytra. It is about one millimeter shorter (average length, 4.5 mm). *L. proximus* is about the same length or even shorter than *L. fuscipennis.*

NOMENCLATURAL NOTES. — No synonymical confusion exists for this race. It was considered to be part of *decipiens,* until Leech recognized that the male aedeagus and coxal file were different. Mexican records other than Baja California undoubtedly refer to *shermani.*

VARIATION. — The mean length of males is about 5.8 mm and that of females is about 5.6 mm — about the same as for *decipiens.* The most southeastern sample (Puebla) has high mean values for all measurements, indicating that there could be a change in size in that peripheral population; but since there are only seven specimens of each sex available, it is not possible to give a conclusive answer. The nearest sample (Huasca, Hidalgo) gives values comparable to the rest of the race. The PW/EL ratio shows no geographical trend. In general, *shermani* presents much the same picture as *decipiens* and maculosus; i.e., widespread, outbreeding populations with little regional specialization within the race.

The female epipleural flange is the most striking variable character in *shermani*, but the only obvious geographical relationship is that it decreases near the northern limit of the race. This decrease suggests influence from *decipiens*.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — The range of *L. m. shermani* covers Arizona, New Mexico, west Texas, and the Mexican Plateau. It is limited on the northeast by the High Plains of New Mexico and on the northwest by the lower Colorado River Valley. In Mexico, it is almost entirely confined to the Central Plateau; but I have collected it once near Mazatlan. Numerous collections in the lowlands of Sonora have not produced any *shermani*, however. It occurs near Monterrey and Saltillo in the Sierra Madre Oriental, but not in the lowlands to the east. The range's southernmost extensions are in Puebla and Michoacan.

L. m. shermani is most commonly found in the Pinon-Juniper zone or lower Ponderosa zone of New Mexico, Arizona, and West Texas; but it does occur in the flats between mountains. It appears to have less ecological tolerance than *decipiens*. In Mexico, it is most frequently found in pine-oak associations or in the pools of streams not exceeding 8000 feet.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ARIZONA.** *Cochise County*. Chiracahua Mtns., N. Portal, 1 ♂, 1 ♀, viii.13.52, H. B. Leech (CAS). Chiracahua Mtns., Herb Martyr L., 3 ♂, 8 ♀, ix.5.61; Cave Canyon Ck., 2 ♂, 3 ♀, ix.5.61, JRZ (NMSU). Douglas, 1 ♀, iii.15.33, W. W. Jones (BERK); 13 m. E., 1 ♀, vi.11.59, L. A. Stange (DAV); 6 m. E., 1 ♂, 1 ♀, v.18.63, K. L. McWilliams (NMSU). Fairbanks, 2, iii.12.36, J. G. Needham (CNL). Huachucha Mtns., Sunnyside Cany., 1 ♂, 2 ♀, viii.4.52, Leech & Green (CAS). Huachucha City, 14 ♂, 8 ♀, ix.6.61, JRZ (NMSU). Palmerlee, 2, viii.—.— (USNM). Portal, SWRS, 5400 feet, 5 m. W., 1 ♀, iv.23.56, E. Ordway (AMNH); Portal, 2 ♀, vii.20.58, J. M. Marston (DAV); Portal, 5 m. W., 1 ♂, 1 ♀, viii.17.58, J. M. Marston (DAV). St. David, 1 ♀, vii.17.45, G. E. Pickford (FM); 7 ♂, 12 ♀, vii.25.61, JRZ (NMSU). Tombstone, 2 ♂, vii.7.44, G. E. Pickford (FM). *Coconino County*. Flagstaff, 7 m. S., 3 ♂, 3 ♀, iv.7.66, J. Schuh (SCH). Grand Canyon, Supai, 3500 feet, 8 ♂, 20 ♀, viii.2-4.34, E. L. Bell; Phantom Ranch, 2500 feet, 1 ♂, 4 ♀, vii.26.34, D. Rockerfeller (AMNH). Williams, 3, ii.6.—, Barber & Schwarz (USNM). *Gila County*. Carrizo Ck., 23 ♂, 31 ♀, vii.20.63, PSB (CAS). Globe, Pinal Ck., 4, iv.25.53, A. & H. Dietrich (CNL); 2 ♀, v.10-11.25, D. K. Duncan (CAS). *Graham County*. Galiuro Mtns., 1,

v.21.—, Hubbard & Schwarz (USNM). Geronimo, 2 ♀, iv.28.24, J. O. Martin (CAS). Graham Mtns., 9500 feet, Snow Flat, 5 ♂, 1 ♀, ix.13.52, B. Malkin (FM). Graham Mtns., Hwy. 666 at Marijilda Canyon, 2 ♂, 8 ♀, viii.3.65, H. B. Leech (CAS). Safford, 10 m. S., 1 ♂, ii.2.36, O. Bryant (CAS). *Greenlee County*. Hardy, 1, Wickham (USNM). *Maricopa County*. Phoenix, 1 (USNM); 34 ♂, 24 ♀ (AMNH). Wickenburg, 5 m. E., Hassayampa R., 2 ♀, iv.2.66, J. Schuh (SCH). *Mohave County*. Peach Springs, 2, —.—.33; 1, viii.27.—, Wickham (USNM). *Navajo County*. Clay Springs, 35 ♂, 37 ♀, vii.21.63, PSB (CAS). Lakeside, 2, vi.11.46, G. P. Mackenzie (CAS); 1 ♂, 3 ♀, viii.22.52, B. Malkin (FM). *Pima County*. Arivaca, Arivaca Ck., 1 ♀, vii.31.52, J. W. Greene (CAS). Lowell Rngr. Sta., 2700 feet, 5 ♂, 7 ♀, vii.6-20.16 (AMNH). San Fernando (now Sasabe), 3, viii.28.25, R. Budlong (USNM). San Xavier Mission, 1, D. K. Duncan (USNM—paratype). Tucson, 1 ♀, ix.11.24, A. A. Nichol (CAS); 1 ♂, vi.1.33; 2 ♂, 2 ♀, ix.—.33, O. Bryant (CAS); 1 ♂, 3 ♀, iii.18.46, J. W. Green (DAV); 3, Shoemaker (USNM); 1, xi.—.24; 1, xi.4.24, Frost; 1, xi.8.27, L. C. Bailey; 1, xi.8.34, K. Thomas; 1, v.22.32 (ARI). Tucson, Santa Catalina Mtns., 4, xi.15.24; 1, x.21.24; 2, xii.4.24, A. A. Nichol (ARI). 1, ix.17.57, C. W. Nichol & O'Brien (ARI); 4, iv.5-18.—, Hubbard & Schwarz (USNM). Tucson, Santa Catalina Mtns., Bear Cany., 1 ♂, xi.15.24, A. A. Nichol; 3 ♂, 8 ♀, i.2.38, Van Dyke (CAS); 1, xi.4.34, L. P. Wehrle; 1, xi.5.35, H. H. Cole; 2, x.16.43, J. Hendrickson (ARI); Tucson, Santa Catalina Mtns., Sabino Canyon, 1, iii.22.52, R. L. Catsitt (ARI); 1, J. W. Tilden (USNM—paratype). Tucson, Santa Catalina Mtns., Molina Basin, 1 ♀, vi.11.58, MacNeil & MacNeil. Tucson, Santa Catalina Mtns., Lowell Rang. Sta., 8, vii.6-20.16 (USNM). County, 1 ♂, x.21.24, A. A. Nichol (BERK). Quitobaquito, O.P.C., Natl. Mon., 2, iv.25.53; 5, v.1.53, A. & H. Dietrich (CNL). *Pinal County*. Aravaipa Cn., near Mammoth, 1, v.21.53, A. & H. Dietrich (CNL). *Santa Cruz County*. Atasco Mtn., 1, ix.26.53, G. D. Butler (ARI). Tumacacori, Sycamore Cn., 1 ♂, 4 ♀, viii.3.52, H. B. Leech (CAS). Near Ruby, 1, xi.20.55, G. D. Butler & F. G. Werner (ARI). Madera Cn., 1 ♂, vii.3.63, V. L. Vesterby (DAV). Nogales, 1 ♂, 2 ♀, viii.19.06; ix.30.06, Blaisdell (CAS); 1 ♀, viii.19.06, F. W. Nunenmacher (FM). Pajarito Mtns., Pena Blanca, 33 ♂, 26 ♀, vii.19.-viii.8.62, R. Arnett & E. Van Tassel (CUA). Pena Blanca Lk., 2 ♂, 3 ♀, iv.4.66, J. Schuh (SCH). Patagonia, 4 m. S., 1 ♂, 3 ♀, iv.4.66, J. Schuh (SCH). Santa Rita Mtns., Box Can., 2 ♂, viii.29.52, B. Malkin (FM); Santa Rita Mtns., Florida Canyon, 4 ♂, 1 ♀, ii.2.62; Santa Rita Mtns., 1, v.29.—, Hubbard & Schwarz (USNM). Tumacacori, Sycamore Cn., 2, vi.3.53, A. & H. Dietrich (CNL). *Yavapai County*. Bloody Basin, 1 ♀, vi.8.47, F. H. Parker (CAS). Castle Hot Springs, 1 ♂, iv.5.42 (AMNH). Minehaha, 1 (USNM); 1 ♀ (AMNH). Prescott, 3, viii.—.— (USNM); 17 ♂, 26 ♀, viii.—.— (AMNH). **NEW MEXICO**. *Bernalillo County*. Albuquerque, 2, C. V. Riley (USNM); 2, M. L. Linell (USNM); 1, vii.2.—, Wickham (USNM); 1 ♂, 2 ♀; 1 ♂, 1 ♀, Wickham (AMNH); 3, vii.7.88 (ISU). *Catron County*. Alma, 15 m. N., 3 ♂, 5 ♀, vii.16.63, R. D. Ohmart (NMSU). Datil, 8 m. S., 4 ♂, 4 ♀, vii.17.63, R. D. Ohmart (NMSU). Quemado, 1 ♂, ix.1.41, O. Bryant (CAS); 16 ♂, 16 ♀, vii.16.63, R. D. Ohmart

(NMSU). *Colfax County*. Near Maxwell, 5 ♂, vii.14.61, JRZ (NMSU). Raton, 1 ♂, iv.25.51, O. Bryant (CAS); 23 m. S.E., 2 ♂, vii.5.63, R. N. Gennaro (NMSU). Van Houten, 7000 feet, 5 ♂, 5 ♀, vii.6.63, R. N. Gennaro (NMSU). *Dona Ana County*. Las Cruces, 1 ♂, vii.9.61, JRZ (NMSU); 1 ♂, vii.6.61, E. Staffeldt & JRZ (NMSU); 1 ♀, x.1.62, K. L. McWilliams (NMSU). Mesilla, 1 ♂, vii.6.61, JRZ (NMSU). *Grant County*. Silver City, 10 m. W., 33 ♂, 50 ♀, vii.16.63, R. D. Ohmart (NMSU). *Harding County*. Gallegos, 41 m. N., 1 ♀, x.23.65, A. H. Smith & T. O. Boswell (NMSU). *Hidalgo County*. Animas, 12 m. S.E., 1 ♂, 2 ♀, K. L. McWilliams (NMSU). Animas Mtns., Double Adobe Ranch (near Animas), 1 ♂, 1 ♀, viii.15.52; 6 ♂, 4 ♀, vii.31.65, H. B. Leech (CAS). *Lincoln County*. Alto (north of Ruidoso), 13 ♂, 12 ♀, vii.27.61, JRZ (NMSU). Angus, Rio Bonito, 1 ♂, 4 ♀, viii.7.65, H. B. Leech (CAS). *Luna County*. Deming, 15 m. N.W., Mimbres R., 9 ♂, 4 ♀, vii.17.61, JRZ; Deming, 10 m. W., Hwy. 26, 1 ♀, iv.20.63, K. L. McWilliams; Hurley, 4 ♂, 1 ♀, vii.17.61, JRZ; Lordsburg, 13 m. E., 1 ♀, K. L. McWilliams (NMSU). *McKinley County*. Ft. Wingate, 26 (USNM). *Sandoval County*. Cuba, 3 m. S.W., 5 ♂, 7 ♀, vii.11.63, R. D. Ohmart; Jemez, Jemez Ck., 1 ♀, iv.30.57, A. Smith (NMSU). *Sierra County*. Arrey, 7.5 m. W., 14 ♂, 4 ♀, iii.20.63, K. L. McWilliams (NMSU). Hillsboro, 4 m. E. (label says Pedra R. Gorge in Mimbres Mtns., but must mean Percha Ck.), 3 ♂, 1 ♀, viii.31.52, B. Malkin (FM); 1 ♂, iv.7.63; Hillsboro, 1 ♂, iv.7.63, JRZ (NMSU). *Socorro County*. Near Bingham, 1 ♂, 3 ♀, vii.21.62, R. D. Ohmart (NMSU). *Torrance County*. Mountainair, 10 m. S., Abo State Mon., 1 ♀, viii.21.67, H. B. Leech (CAS). *Valencia County*. Bluewater, 1, 1933, Wickham (USNM). Fence L., 4 m. S., 3 ♀, vii.18.63, R. D. Ohmart (NMSU).

TEXAS. *Brewster County*. Marathon, 4 m. S., 1 ♂, ix.5.52, B. Malkin (FM). *Culberson County*. Nickel Creek Sta., 2 m. E., 11 ♂, 8 ♀, ix.2.52, B. Malkin; 1 ♂, ix.2.52, B. Malkin & V. Thatcher; 1 ♀, ix.9.52, B. Malkin (FM). *El Paso County*. Clint, 1 m. W., 11 ♂, 5 ♀, vii.19.61, JRZ (NMSU). *Jeff Davis County*. Davis Mtns., 1 (CNL); 1, vii.16.41, B. E. White (CNL); 1 ♂, 1 ♀, v.9.51; 2 ♂, 1 ♀, x.11.49, O. Bryant (CAS); Davis Mtns., Limpia Can., 14 ♂, 12 ♀, iv.19.53, B. L. Adelson & M. Wasbauer (BERK); 11 ♂, 10 ♀, iv.19.53, A. J. Adelson & M. Wasbauer (CAS); 1 ♂, ix.4-5.52; Davis, 13 m. S., Kent, 4 ♂, 1 ♀, ix.8.52; 1 ♂, ix.13.52, B. Malkin (FM). Davis Mtns., Elbow Can. Ck., 10 ♂, 9 ♀, x.27.61; Madera Can. Ck., 2 ♂, viii.3.61; Limpia Can. Ck., 3 ♂, 3 ♀, viii.3.61, JRZ (NMSU). Ft. Davis, 1, vi.10.14, C. Thompson (USNM); 2 ♂, 3 ♀, viii.3.61 (NMSU).

MEXICO.—**AGUASCALIENTES.** Aguascalientes, 1 m. N., 5 ♂, 5 ♀, vii.26.62, JRZ (NMSU). **CHIHUAHUA.** Chihuahua City, 1 ♂, Höge (AMNH) (ex. B. C. A. Coll.); Chihuahua, 43 m. N., 18 ♂, 19 ♀, xii.8.62; Camargo, 1 m. N., 1 ♂, vii.25.62; Casas Grande, 5 m. E., 9 ♂, 11 ♀, vii.20.64; Colonia Juarez, 2 m. S.W., 11 ♂, 16 ♀, xii.20.64; Hidalgo de Parral, 2 m. S., 1 ♂, 2 ♀ vii.25.62; 10 m. S., 1 ♂, 2 ♀, xii.9.62; JRZ (NMSU). Primavera, 5 ♂, 4 ♀, vi.30.47, M. Cazier, R. Shrammel, W. Gertsch (AMNH). Santa Barbara, 63 m. W., 5500 feet, 1 ♂, vii.20.47, Gertsch (AMNH). Zaragosa, 1 ♂, 1 ♀, vii.19.61,

JRZ (NMSU). **COAHUILA.** Ramos Arizpe, 5 ♂, 7 ♀, vii.7.63, JRZ (NMSU). **DURANGO,** 1, Wickham (USNM). Durango, 20 m. W., 4 ♂, 7 ♀, xii.10.62, JRZ (NMSU). El Pino, 5 m. N., 1 ♂, 1 ♀, J. D. Lattin (BERK). LaZarca, 15 m. N., 15 ♂, 17 ♀, vii.25.62; Llano Grande, 10 m. E., 1 ♂, 1 ♀, xii.10.62; Nombre de Dios, 1 ♂, 4 ♀, vii.26.62; San Juan Del Rio, 10 m. N., 2 ♂, 3 ♀, xii.9.62, JRZ (NMSU). **GUANAJUATO.** Irapuato, 5 m. S., 1 ♀, vii.27.62, JRZ (CAS). **HIDALGO.** Near Huasca (San Miguel Regla), 3 ♂, 1 ♀, vii.10.63; Zimapan, 1 ♂, 2 ♀, vii.9.63, JRZ (NMSU). **MICHOACAN.** Insurgentes Morelos Pk., 1 ♀, vii.27.62, JRZ (NMSU). **NUEVO LEON.** Sta. Catarina, Huasteca Can., 3 ♂, 4 ♀, vii.7.63, JRZ (NMSU). **PUEBLA.** Acatzingo, 2 ♂, 1 ♀, viii.28.62; Cuapiaxtla 5 ♂, 6 ♀, viii.24.62, JRZ. San Martin Texmelucan, 1 ♂, 1 ♀, viii.24.62, JRZ (NMSU). **QUERETARO.** San Juan Del Rio, 1 ♂, 2 ♀, iii.27.63, JRZ (NMSU). **SAN LUIS POTOSI.** San Luis Potosi, 2 m. S., 1 ♂, 3 ♀, xi.21.48, H. B. Leech (CAS). Santa Maria del Rio, 2 ♂, 3 ♀, iii.26.63, JRZ (NMSU). **SINALOA.** Mazatlan, 7 m. S., 4 ♂, 4 ♀, xii.11.62, JRZ (NMSU). **SONORA.** Bavispe, 1 ♂, vii.26.63, JRZ (NMSU). **ZACATECAS.** Fresnillo, 61 m. S., 1 ♂, 1 ♀, vi.25.54, R. H. Brewer (CAS); 16 m. N.W., Rio Trujillo, 1 ♂, 1 ♀, vi.29.54 (CAS); 45 m. W., 7700 feet, 1 ♂, 2 ♀, vi.25.54, R. H. Brewer (CAS). Laguna Balderama, 8200 feet, vii.8.54, R. H. Brewer (CAS). Pinos, 10 m. S., 1 ♀, viii.1.59, Ray Bandar (CAS). Sombrerete, 10 m. W., 1 ♂, 4 ♀, vii.1.54, R. H. Brewer (CAS).

Intergradation in Laccophilus maculosus

There are two intergrade zones in *Laccophilus maculosus* — one between *maculosus* and *decipiens* and the other between *decipiens* and *shermani*. Intergrades between *maculosus* and *decipiens* occur in a band from northeastern Colorado, through Nebraska and South Dakota, and into southern Manitoba. Figure 280 is an illustration of an intergrade elytral pattern from Colorado. Presumably, intergrades also occur in eastern Wyoming and western North Dakota; but they have not yet been recognized. It is not surprising that they have not been detected, however. Intergrades can be difficult to determine in many instances, and even large samples usually include only a few individuals that are intermediate for several characters. Most populations seem to be composed mainly of F_2's or backcrosses with one of the parental races.

Intergrades between *decipiens* and *shermani* occur in a narrow zone extending from north central New Mexico through northern Arizona to a single, indefinitely placed locality in eastern Riverside County in California. These intergrades could be verified only if the aedeagus was intermediate. The elytral patterns are too similar to show intergradation. The female epipleural flange should be helpful

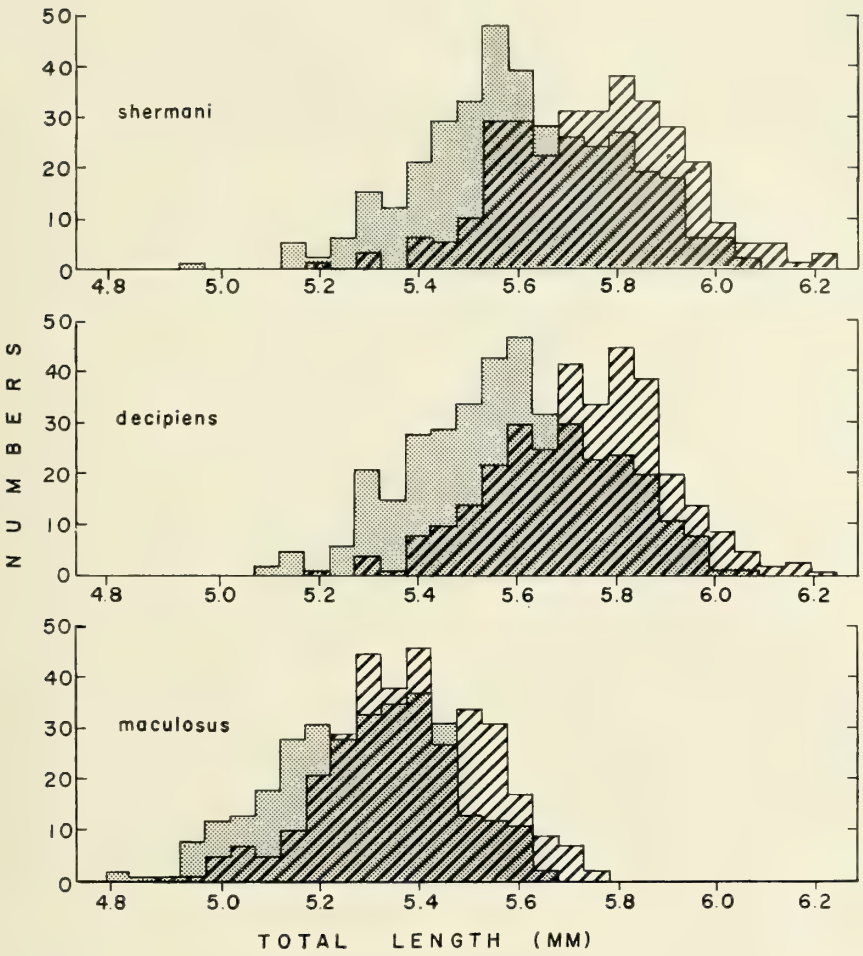

Figure 4. Histograms of length in *Laccophilus maculosus*. Males are shown crosshatched; females, stippled.

since an intergrade should have it situated in a position intermediate between those of *decipiens* and *shermani*. Only a few females from the intergrade zone have the flange; and, usually, the sample size is too small to collect one with a flange.

Both intergrade populations show chaotic mixing; thus, it seems that, in both cases, secondary hybridization has occurred. Within the zone, any one specimen may 1) show no sign of intermediacy, 2) show only a trace of mixture in perhaps but one character, or 3) be

intermediate in all characters (rarely). Elytral patterns or aedeagi provide the best evidence for intergradation, but the coxal files are also useful on occasion. A population from El Paso County, Colorado, which appears to be well within the range of *decipiens,* contained two specimens that had only 36 lines in the file; five others had counts in the middle forties, which is more typical of *decipiens.* Apparently, there is some gene flow from *shermani* influencing the population.

The narrowness of the zones is difficult to explain. Possible explanations are that there is incomplete gene flow between the races or that the ecological requirements of the races are sufficiently stringent to limit the intergrades to an intermediate environment. The latter appears true in the case of *decipiens* and *maculosus,* since they merge in the northern plains — beyond their usual habitats of ponds in coniferous or deciduous forests. If one assumes that the range of the two races has been expanding and that permanent populations are relatively scarce in the area of intergradation, then it might be expected that there would be considerable variation in the degree of hybridization in different populations.

This argument is less pertinent to *decipiens* and *shermani,* however. There is little or no apparent ecological difference on either side of the intergrade zone, but the zone appears extremely narrow — perhaps not over 100 miles wide. More analysis may show a wider zone than indicated in the present paper, but as yet there is no evidence of swamping. It is entirely possible that an equally correct argument could be presented for maintaining *shermani* as a separate species.

MATERIAL EXAMINED

L. m. maculosus × *L. m. decipiens*

CANADA. — **MANITOBA.** Aweme, 1, vi.4.03, N. Criddle (USNM); 1 ♂, 1 ♀, ix.1.28, E. C. (USNM). Husavick, 2 ♂, 2 ♀, vii.8.—, J. B. Wallis (AMNH). Man., 1 ♀ (MCZ). Stony Mtn., 1 ♀, v.28.—, J. B. Wallis (AMNH). Treesbank, 9 ♂, 5 ♀, vii.25.—, J. B. Wallis (AMNH). Winnipeg, 1 ♂, viii.27.27, P. J. Darlington, Jr. (MCZ); 1 ♂, iv.23.25, L. H. Roberts (USNM).

UNITED STATES OF AMERICA. — **COLORADO.** *Boulder County.* Boulder, 1 ♀, ix.25.17, Hubbard; 1 ♀, viii.—.16, S. D. Pokling (AMNH). *Larimer County.* Ft. Collins, 1, x.15.47 (USNM); 1, x.8.51, Bryant; v.20.32; County, 1 ♂ (AMNH). **NEBRASKA.** *Thomas County.* Dismal River on Hwy. 83, 19, vii.15.67, H. B. Leech (CAS). **SOUTH DAKOTA.** *Custer County.* Custer

St. Pk., 1 ♀, vi.20.55, W. A. Drew (MCHS). *Pennington County*. Badlands N. Mon., 1 ♀, viii.7.52, B. Malkin & V. Thatcher (FM). Wasta, 1 ♂, viii.7.52, B. Malkin (FM).

L. m. decipiens × *L. m. shermani*

UNITED STATES OF AMERICA. — **ARIZONA.** *Navajo County*. Little Colorado Riv., 8 ♂, 8 ♀, vii.23.63, PSB (CAS). **CALIFORNIA.** *Riverside County*. County, Sonorian (sic!) Region, Colorado R., 10 ♂, 4 ♀, F. E. Winters; 8 ♂ with *shermani* aedeagus, 1 ♂ with *decipiens* aedeagus and 1 ♂ an intergrade; all females, with epipleural expansion in *shermani* position. **NEW MEXICO.** *Colfax County*. Cimarron, 10 m. N., 2 ♂, 8 ♀, vii.15.65, A. H. Smith & T. O. Boswell (NMSU). *Rio Arriba County*. Canjilon, 3 m. W., 1 ♂, 5 ♀, ix.25.65, A. H. Smith & T. O. Boswell (NMSU). El Rito, 18 ♂, 13 ♀, vi.23.65, JRZ, A. H. Smith, R. L. Smith; 9 ♂, 19 ♀, ix.25.65, A. H. Smith, T. O. Boswell (NMSU). Brazos, 1 ♀, viii.11.65, H. B. Leech (CAS). Ojo Caliente, 44 ♂, 27 ♀, vi.23.65, R. L. Smith, A. H. Smith, JRZ (NMSU). Parkview (11 m. S., Chama), 8 ♂, 9 ♀, vi.23.65, JRZ, A. H. Smith, R. L. Smith (NMSU). *San Miguel County*. Las Vegas, 21 m. S., 1 ♀, vii.16.65, A. H. Smith & T. O. Boswell (NMSU). Mosquero, 19 m. W., 3 ♂, 12 ♀, x.23.65, A. H. Smith (NMSU). Trujillo, 19 m. E., Trementina Ck., 4 ♂, 6 ♀, A. H. Smith & T. O. Boswell (NMSU).

LACCOPHILUS FASCIATUS

This is a wide-ranging polytypic species with three readily distinguished subspecies. Each race was previously considered a separate species. *Laccophilus fasciatus* (= *apicalis* Sharp) was described by Aubé in 1838 from material from the United States and Mexico. The only type still available is from Mexico. *L. rufus* was described by Melsheimer in 1846 from Pennsylvania and was long considered to be a synonym of *L. fasciatus*. *L. terminalis* is from Texas (Sharp 1882a). The nominate subspecies is a tropical one that extends south in South America and north to the Mexican Plateau. It intergrades with *terminalis* in the northeastern and northwestern coastal lowlands of Mexico. The latter occurs throughout the Mexican Plateau, the southwestern United States, and the Great Plains to South Dakota. It intergrades with *rufus* from Kansas (or Nebraska?) south to east-central Texas. *L. f. rufus* occurs throughout the eastern United States north of the Florida Peninsula.

L. f. terminalis noticeably differs from *rufus* only in elytral pattern and aedeagus. The former may be slightly larger, but neither shows any differences in size between the sexes. *L. f. fasciatus* dif-

fers from *terminalis,* not only in elytral pattern and aedeagus, but also in quantitative characters. It is smaller, relatively wider, and has a difference average size for males over females.

Intergradation between *rufus* and *terminalis* has resulted from secondary contact at about the boundary of eastern acid pedalfer soils and western alkaline pedocals. One race is the geographical and ecological replacement of the other, and intergrades persist in an intermediate environment. The pattern of intergradation is complex between *fasciatus* and *terminalis.* Intergrade populations commonly occur in the coastal lowlands and lower mountains from Nayarit to southern Arizona and, more rarely, (perhaps due to insufficient collecting) in the northeastern Mexican coastal lowlands. In Jalisco, however, *fasciatus* and *terminalis* are sympatric. This situation is confusing, since there appears to be no barrier between them and intergrading populations in Nayarit.

DESCRIPTION. — Medium-sized (length 4.3 to 5.2 mm; width 2.3 to 2.8 mm), brown, irrorated species with more or less complete black fascia or blotch across the posterior half of elytra; metacoxal file present; prosternal process short; ovipositor sawlike. COLOR. *Head*: yellow above and beneath, sometimes with reddish-brown tint, especially between the eyes at the base of the pronotum; appendages pale yellow except mandibles which darken to brownish-red toward tip. *Pronotum*: pale brownish-yellow with reddish tint. *Elytra*: brown to dark brown irrorations on a pale yellow or brownish-yellow background, intensifying and coalescing in the posterior half to form a transverse fascia or blotch that varies from merely suggested in *terminalis* to solid black from one side to the other in *fasciatus* (figs. 282, 288); anterior half with finger-like extensions irroration of variable intensity and completeness; apices pale or darkened; epipleura pale yellow in broad anterior half, but dark brown in constricted posterior half. *Tergite VIII*: basal half dark brown; distal half of the same color in the nominate race, but pale yellow or reddish-yellow in the other two races. *Venter*: varying from yellow to reddish-brown; usually darkest on lateral portions of metacoxal plates and posterior margins of abdominal sclerites; front and middle legs pale yellow; hind legs yellow basally and becoming more reddish-brown distally; oblique striations variable from yellow to reddish-brown. *Genitalia*: variable from yellow and light brownish-red to dark reddish-brown; oval plate and left paramere usually paler than other parts. ANATOMY. *Microreticulation*: weakly double on head, pronotum, and elytra; secondary mesh discernible, but individual cellules still apparent. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: WH/PW, 0.67 to 0.69; LP/PW, 0.41 to 0.42. *Elytra*: epipleural flange frequently present in females of the nominate race, but absent in the other females; truncation of the elytral apices slight. *Venter*: coxal file prominent in males, composed of about 20 to 30 lines; prosternal process with well-defined crest; lobes of postcoxal processes

Table 2. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus fasciatus*.

Laccophilus f. fasciatus

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Autlan, Jalisco	♂	74	4.80	0.113	3.75	0.109	....	2.78	0.071	2.18	0.055	0.582	0.0027
	♀	92	4.74	0.128	3.68	0.109	....	2.74	0.071	2.14	0.061	0.582	0.0022
Barra de Navidad, Jalisco	♂	15	4.77	0.146	3.69	0.119	....	.....	.....	2.15	0.076	0.584	0.0043
	♀	18	4.73	0.174	3.67	0.134	....	2.77	0.084	2.15	0.078	0.587	0.0072
Cuitlahuac, Veracruz	♂	23	4.71	0.211	3.69	0.167	(13)	2.68	0.115	2.15	0.097	0.583	0.0030
	♀	34	4.56	0.184	3.58	0.153	....	2.65	0.107	2.08	0.090	0.582	0.0035
Martinez de Torre, Veracruz	♂	23	4.68	0.112	3.67	0.087	....	.....	.....	2.13	0.058	0.579	0.0032
	♀	15	4.50	0.158	3.55	0.126	....	2.62	0.097	2.07	0.073	0.585	0.0045
Catemaco, Veracruz	♂	10	4.73	0.148	3.67	0.106	....	.....	.....	2.12	0.059	0.579	0.0081
	♀	13	4.63	0.140	3.61	0.125	....	2.67	0.086	2.10	0.074	0.583	0.0066
Chenchoyi, Campeche	♂	46	4.82	0.116	3.77	0.085	(37)	2.77	0.075	2.21	0.064	0.585	0.0029
	♀	46	4.74	0.129	3.73	0.101	....	2.76	0.078	2.17	0.063	0.583	0.0029
Juchitan, Oaxaca	♂	30	4.62	0.149	3.63	0.124	....	2.67	0.093	2.12	0.088	0.584	0.0048
	♀	39	4.48	0.172	3.51	0.147	....	2.59	0.098	2.04	0.870	0.581	0.0036
Chiapa de Corzo, Chiapas	♂	24	4.61	0.152	3.59	0.144	....	2.67	0.081	2.11	0.073	0.586	0.0047
	♀	24	4.50	0.170	3.52	0.133	....	2.61	0.093	2.05	0.097	0.582	0.0052
Guatemala	♂	47	4.64	0.155	3.61	0.123	(20)	2.70	0.109	2.12	0.082	0.587	0.0048
	♀	48	4.61	0.188	3.60	0.161	(36)	2.68	0.131	2.11	0.085	0.586	0.0047

Table 2 (*continued*)

Laccophilus f. fasciatus

Locality		N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
Nicaragua	♂	57	4.62 0.148	3.59 0.124	(38)	2.68 0.099	2.10 0.070	0.585	0.0049
	♀	58	4.60 0.168	3.59 0.134	(33)	2.68 0.101	2.09 0.077	0.582	0.0039
Honduras	♂	41	4.68 0.098	3.65 0.097	(19)	2.73 0.080	2.15 0.050	0.589	0.0048
	♀	48	4.62 0.132	3.61 0.121	(23)	2.68 0.126	2.12 0.063	0.587	0.0052
Costa Rica	♂	57	4.56 0.152	3.54 0.134	(33)	2.69 0.121	2.10 0.081	0.593	0.0044
	♀	46	4.50 0.164	3.47 0.144	(44)	2.65 0.119	2.07 0.084	0.596	0.0053
Laccophilus f. terminalis									
Seward Co., Kansas		29	4.77 0.146	3.71 0.117	(23)	2.67 0.083	2.12 0.063	0.573	0.0039
Brownsville, Texas		7	4.71 0.120	....	....	....	....	.....	.....
Bexar Co., Texas		33	4.78 0.181	3.74 0.155	(21)	2.67 0.116	2.11 0.074	0.565	0.0040
Val Verde Co., Texas		25	4.75 0.137	3.76 0.114	(24)	2.68 0.071	2.11 0.068	0.561	0.0039
Brewster Co., Texas		30	4.71 0.140	3.69 0.125	....	2.66 0.085	2.10 0.073	0.570	0.0034
J. Davis Co., Texas		66	4.88 0.166	3.74 0.144	(58)	2.69 0.103	2.12 0.076	0.568	0.0030
Culberson Co., Texas		43	4.80 0.156	3.79 0.131	(36)	2.67 0.089	2.13 0.066	0.562	0.0048
San Miguel Co., New Mexico		96	4.80 0.124	3.76 0.114	....	2.70 0.101	2.15 0.064	0.571	0.0023
Dona Ana Co., New Mexico		70	4.83 0.146	3.77 0.128	(62)	2.72 0.084	2.15 0.073	0.570	0.0022

Table 2 (*continued*)

Laccophilus f. terminalis

Locality	N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
Cochise Co., Arizona	51	4.82 0.172	3.76 0.124	....	2.71 0.082	2.15 0.070	0.571	0.0021
Santa Cruz Co., Arizona	66	4.75 0.164	3.70 0.144	(54)	2.68 0.111	2.13 0.085	0.575	0.0027
Yavapai Co., Arizona	48	4.90 0.204	3.84 0.151	(35)	2.79 0.099	2.20 0.088	0.572	0.0035
Maricopa Co., Arizona	89	4.77 0.155	3.76 0.152	(67)	2.71 0.100	2.13 0.070	0.568	0.0027
Imperial Co., California	18	4.83 0.178	3.78 0.127	....	2.74 0.033	2.15 0.097	0.568	0.0049
Los Angeles Co., California	24	4.81 0.137	3.75 0.108	....	2.72 0.099	2.14 0.071	0.571	0.0043
San Luis Gonzaga, Baja California	74	4.95 0.152	3.86 0.135	....	....	2.23 0.071	0.577	0.0034
La Paz, Baja California	54	4.85 0.159	3.78 0.146	....	....	2.19 0.079	0.579	0.0030
Chihuahua, Chihuahua	96	4.89 0.139	3.82 0.108	....	2.75 0.087	2.18 0.067	0.570	0.0020
Abasolo, Durango	96	4.83 0.157	3.76 0.125	....	2.71 0.095	2.16 0.075	0.574	0.0017

Table 2 (*continued*)

Laccophilus f. terminalis

Locality	N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Linares, Nuevo Leon	12	4.92	0.192	3.80	0.153	(11)	2.74	0.097	2.16	0.089	0.568	0.0055
Cd. del Maiz, S. L. Potosi	28	4.84	0.118	.....	.....	....	.....	.....	.....	.....	.....	.....
Pinos, Zacatecas	14	5.01	0.088	.....	.....	....	.....	.....	.....	.....	.....	.....
Queretaro, Queretaro	58	4.90	0.169	3.81	0.135	(47)	2.76	0.107	2.18	0.076	0.573	0.0025
Guadalajara, Jalisco	26	4.88	0.169	3.82	0.116	(23)	2.76	0.095	2.18	0.071	0.570	0.0045
Tizapan, Jalisco	38	4.90	0.135	3.82	0.092	(30)	2.76	0.084	2.18	0.059	0.572	0.0031
Mezquitan, Jalisco	32	4.94	0.181	3.83	0.137	(23)	2.77	0.110	2.17	0.069	0.567	0.0037
Laccophilus f. rufus												
Southeastern United States	69	4.68	0.169	3.68	0.133	(67)	2.60	0.095	2.09	0.080	0.567	0.0028
New York, New York	21	4.90	0.127	3.87	0.094	(18)	2.74	0.084	2.19	0.065	0.566	0.0047
Allegheny Co., Pennsylvania	37	4.81	0.106	3.82	0.059	....	2.68	0.071	2.15	0.059	0.560	0.0032
Monroe Co., Indiana	115	4.74	0.146	3.77	0.111	....	2.65	0.080	2.12	0.068	0.563	0.0018
Alexander Co., Illinois	24	4.72	0.115	3.76	0.094	....	2.63	0.720	2.11	0.058	0.561	0.0033
Douglas Co., Kansas	73	4.72	0.145	3.73	0.114	....	2.64	0.095	2.09	0.072	0.599	0.0027

Table 2 (*continued*)

L. f. rufus × *L. f. terminalis*

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Harvey Co., Kansas		61	4.75	0.121	3.74	0.099	(43)	2.65	0.077	2.12	0.062	0.566	0.0022
Sedgwick Co., Kansas		131	4.70	0.151	3.72	0.112	(100)	2.65	0.092	2.11	0.059	0.567	0.0019
Harper Co., Kansas		46	4.75	0.132	3.72	0.106	(30)	2.64	0.075	2.10	0.059	0.566	0.0033
Kay Co., Oklahoma		63	4.77	0.135	3.75	0.095	(44)	2.66	0.080	2.13	0.060	0.567	0.0030
Dallas Co., Texas		51	4.73	0.150	3.68	0.120	(49)	2.63	0.100	2.08	0.077	0.565	0.0024
Lee Co., Texas		32	4.73	0.182	3.73	0.140	....	2.64	0.106	2.09	0.080	0.561	0.0035
L. f. fasciatus × *L. f. terminalis*													
Navajoa, Sonora		14	4.76	0.174	3.71	0.132	(6)	2.66	0.126	2.12	0.78	0.572	0.0057
Culiacan, Sinaloa		28	4.75	0.147	3.70	0.104	(11)	2.73	0.077	2.14	0.064	0.580	0.0036
Mazatlan, Sinaloa	♂	34	4.79	0.142	3.70	0.121	....	2.72	0.084	2.14	0.076	0.581	0.0031
	♀	46	4.65	0.182	3.60	0.151	....	2.67	0.113	2.10	0.097	0.582	0.0034
Elota, Sinaloa	♂	9	4.77	0.193	3.73	0.175	(6)	2.74	0.088	2.15	0.083	0.578	0.0067
	♀	11	4.63	0.107	3.64	0.097	....	2.69	0.080	2.14	0.070	0.587	0.0068
Antigua Morelos, Tamaulipas	♂	36	4.70	0.158	3.68	0.128	(32)	2.71	0.082	2.13	0.072	0.578	0.0035
	♀	36	4.58	0.182	3.57	0.146	(34)	2.66	0.096	2.07	0.082	0.578	0.0040

rounded and laterally projecting well posterior to midline; last visible ventral abdominal segment rounded and similar in males and females; that of males slightly produced and with an asymmetrical curving ridge in middle; last segment of females weakly arched with posterior margin not noticeably produced. *Legs*: male pro- and mesotarsi enlarged in a dorsoventral plane; palettes easily distinguished at 20 power magnification; male fifth tarsal segments on both pair of legs twice as long as corresponding fourth; profemoral setae (5 to 7) shorter and finer than mesofemoral ones (5 to 7). *Genitalia*: oval plate large and produced to acuminate tip with ventral crest curving to the right as it extends forward; an indefinite number of raised lines lying on either side of crest; aedeagus curved and narrowing toward apex; right paramere produced at apex; ovipositor with about 11 teeth on each ridge.

Laccophilus fasciatus fasciatus Aubé, new synonymy and new status
(Figs. 39-44, 47, 50, 51, 288)

Laccophilus fasciatus Aubé, 1938, p. 423. *Type*: Institut Royal des Sciences Naturelles de Belgique, number 2842, female: type locality here restricted to Cuitlahuac, Vera Cruz, Mexico.

Laccophilus apicalis Sharp, 1873, p. 53; Sharp, 1882a, p. 291; Sharp, 1882b, p. 10; Darlington, 1936, p. 153; Leech, 1948a, p. 65.

DIAGNOSIS. — The dark blotch across the posterior part of the elytra will separate this race from all other irrorated species in Mexico and Central America except *salvini*. It is black beneath, however, while *fasciatus* is reddish-brown to brown. *L. salvini* also lacks subbasal finger-like projections on the elytral pattern.

NOMENCLATURAL NOTES. — This race has long been recognized as *L. apicalis* Sharp, and *fasciatus* has been ascribed to the populations in the eastern United States; but, unfortunately, Aubé described *fasciatus* from mixed material from the United States and Mexico. The only known specimen used in the original description is a female from Mexico; thus, the name *fasciatus* must be used for the southern subspecies. The species name remains the same, since both are members of one polytypic species.

VARIATION. — Individual variation in color and pattern seems as great as any geographic variation except for intergrade influence from *terminalis*. There are some important sexual and geographic variations in quantitative characters, however. *L. f. fasciatus* males are about 0.1 mm longer and 0.05 mm wider than females (Table 2). The PW/EL ratio, which is the same for both sexes, shows an increase in Honduras and Costa Rica. From Nicaragua north, the PW/EL value is about 0.583 with no value exceeding 0.587; but south of Nicaragua, the averages are 0.587 to 0.596. This means

Figure 5. Distribution of *Laccophilus fasciatus*.

that the southern Central American populations are relatively wider than the ones to the north. There does not appear to be any significant difference in length, however, between the two areas.

But specimens from the Yucatan Peninsula are larger. A sample (N = 46 for each sex) from Chenchoyi, Campeche, was larger in all measurements than any other locality except Autlan, which might be reflecting influence from *terminalis*. The closest samples to Chenchoyi (Catemaco, Vera Cruz and Chiapa de Corzo, Chiapas) are smaller for all measurements, although the WP/EL ratios are the same.

The heterogenity of *L. f. fasciatus* is also reflected in a plot of the frequency distribution for length (Fig. 6). The curve for females has two peaks — one at about 4.75 mm and the other at 4.60 mm.

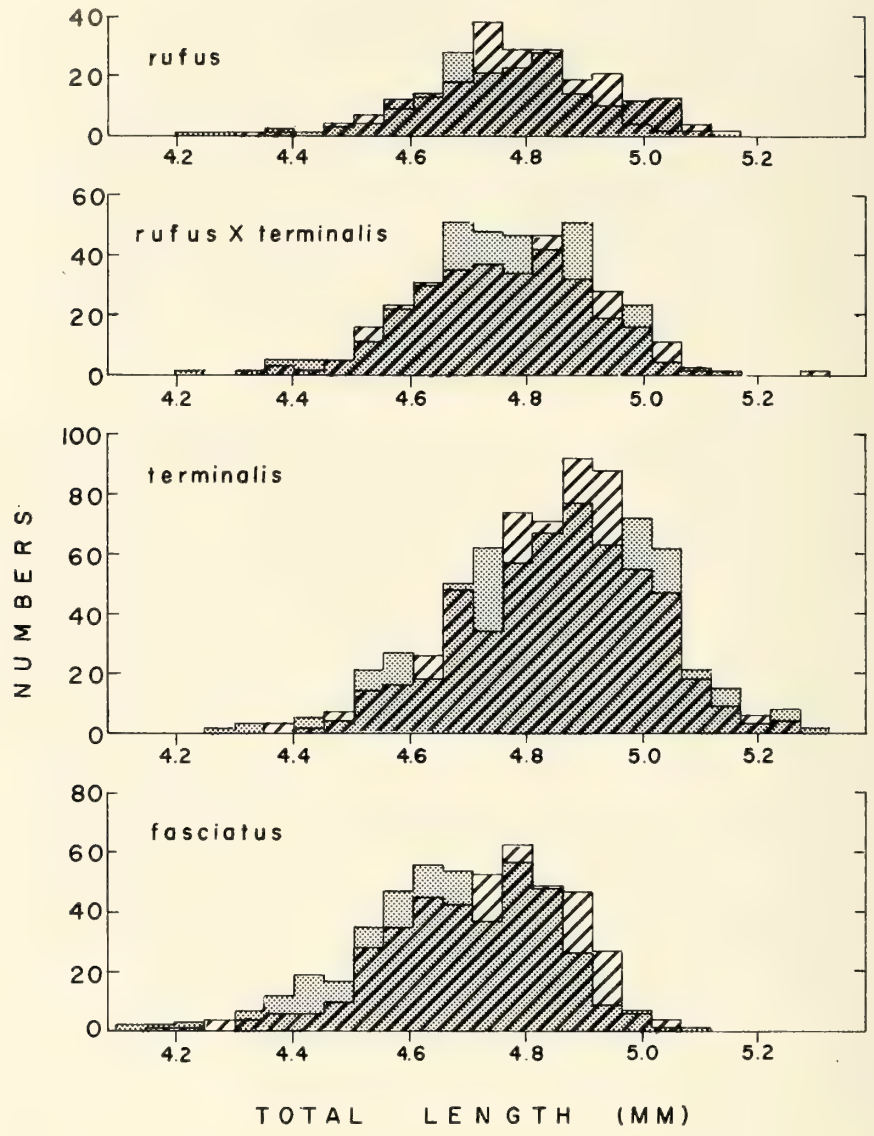

Figure 6. Histograms of length in *Laccophilus fasciatus*. Males are shown crosshatched; females, stippled.

The number of specimens is too large to assume sampling error in this case. There is only one peak for males (also at about 4.75 mm), but there is a bulge on the left slope which suggests another peak might be hidden in the curve. In contrast, the curves for *terminalis*

and *rufus* have single definite peaks and even slopes. The larger population from the Yucatan Peninsula might account for these irregularities.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — The northern boundary of *L. f. fasciatus* forms a U-curve lying on the separation of the Nearctic and Neotropical Realms. It intergrades with *terminalis* in coastal Tamaulipas in northeastern Mexico and in several states in northwestern Mexico. Both races occur in Jalisco, but evidence of intergradation is slight. *L. f. fasciatus* appears to be continuously distributed in the lowlands all the way into South America and is generally absent from the volcanic highlands of Puebla, Morelos, Mexico, and Guerrero.

It is usually found below 3000 feet. It is most common in roadside ditches, pools of streams, sloughs, and stock ponds. The race is most abundant in shallow water in marginal vegetation and debris.

MATERIAL EXAMINED

COSTA RICA. — Bagaces, Guanacaste, 6 ♂, 5 ♀, vii.12.57; Guanacaste, 1 ♂, 2 ♀, vii.17.57, D. R. Lauck (USNM). La Cruz, 16 m. S., 100+, vii.25.65; Liberia, 8 m. SE., 10 ♂, 12 ♀, vii.24.65; Pacuare, 2 ♀, vii.2.67; Punta Arenas, 2 ♂, 4 ♀, vii.22.65; Rivas, 22 m. S., 2 ♀, vii.26.65, P. J. Spangler (USNM). San Jose, 2 ♂, 2 ♀, vii.16.57, D. R. Lauck (USNM). Taboga, Agr. Exp. Sta., 34 ♂, 40 ♀, vi.27.67; 14 ♂, 7 ♀, vi.28.67; Turrialba, 50+, vii.15.65, P. J. Spangler (USNM).

EL SALVADOR. — Acajutla, 19 m. S., 3 ♂, 2 ♀, vii.8.65; Acajutla, 7 ♂, 7 ♀, viii.4.64; Cd. Arce, 7 m. SE., 1 ♂, viii.3.65; La Union, 15 m. SE., 14 ♂, 10 ♀, vii.31.65, P. J. Spangler (USNM). La Union, Santa Rosa, 1 ♀, vii.23.57; 2 ♂, vii.24.57, D. R. Lauck (USNM).

GUATEMALA. — Aldea Jesus Maria, 49 ♂, 54 ♀, viii.15.65; El Progreso, 5 m. S., 2 ♀, viii.11.65; Escuintla, 17 m. E., 2 ♂, vii.8.65; Guatemala City, 20 m. S., 1 ♂, 1 ♀, vii.7.65, P. J. Spangler, Jr. (USNM). Mazatenengo, 1 ♀, viii.1.57, D. R. Lauck (USNM). Morales, 1 m. N., 1 ♂, viii.16-18.65; Pijije, 2 ♂, 2 ♀, vii.8.65; 15 m. W., 4 ♂, 10 ♀, viii.5.65, P. J. Spangler, Jr. (USNM). Suchit, Rio Sis, 22 km. S. La Maquina, 1 ♂, vi.11.65, O. S. Flint (USNM).

HONDURAS. — Choluteca, 10 m. W., 25+, vii.29.65; Jicaro Galan Jct., 2 ♀, vii.29.65, P. J. Spangler, Jr. (USNM). Morazan, 5 ♂, 4 ♀, vii.22.57, D. R. Lauck (USNM). Pespire, 2 ♂, 2 ♀, vii.29.65; Sabana Grande, 10 m. N., 4 ♂, 10 ♀, vii.29.65, P. J. Spangler, Jr. (USNM).

MEXICO. — **CAMPECHE.** Champoton, 11 m. SW., 7 ♂, 3 ♀, xi.27.63; Chencholli, 100 ♂, 122 ♀, xi.28.63; Hopelchen, 18 m. NE., 6 ♂, 11 ♀, xi.28.63, JRZ (NMSU). **CHIAPAS.** Chiapa de Corzo, 4 m. E., 27 ♂, 26 ♀, ix.1.63; Cin-

talapa, 5 m. W., 2 ♂, 4 ♀, ix.1.63; Comitan, 8 ♂, 13 ♀, viii.30.63; 13 m. W., 1 ♂, 2 ♀, viii.30.63; Cuahtemoc, 5 ♂, 6 ♀, viii.30.63; 4 m. W., 16 ♂, 18 ♀, viii.30.63, JRZ (NMSU). Las Cruces, 5 m. S., 12 ♂, 17 ♀, viii.23.65; P. J. Spangler, Jr. (USNM); Near Pichucalco, 3 ♂, 2 ♀, xi.26.63; Ocozucuatla, 6 m. W., 4 ♂, 3 ♀, ix.1.63; Ixtapa, 1 ♂, viii.31.63; Tuxtla Guttierrez, 2 ♂, 2 ♀, ix.1.63; 10 m. W., 5 ♂, 3 ♀, ix.1.63; JRZ (NMSU). **COAHUILA.** Torreon, 1 ♂, M. Embury (CAS) (Intergrade?). **COLIMA.** Colima, 7 m. NE., 6 ♂, 2 ♀, xii.3.48, H. B. Leech (CAS). Manzanillo, 5 m. S., 4 ♂, 3 ♀, vii.29.62; Trapechi, 9 ♂, 4 ♀, vii.30.62, JRZ (NMSU). **JALISCO.** Atenquique, 1 ♀, xii.5.48, H. B. Leech (CAS). Autlan, 9 m. SW., 34 ♂, 55 ♀, x.24.66; Autlan, 17 ♂, 18 ♀, x.26.66, A. H. Smith & JRZ (NMSU). Barra de Navidad, 1 ♂, 6 ♀, iii.18.61, C. O. Morse (CAS); 2 ♂, 2 ♀, vi.6.63, K. L. McWilliams; 5 ♂, 8 ♀, x.25.66; La Heurta, 6 m. S., 1 ♂, 1 ♀, x.24.66; 5 m. N., 7 ♂, 7 ♀, x.25.65, A. H. Smith & JRZ (NMSU). Mazamitla, 1 m. N., 1 ♂, 2 ♀, ii.8.53, I. J. Cantrell (UMMZ). Between Union de Tula and Autlan at Rio de San Pedro, 22 ♂, 34 ♀, iii.28.64, JRZ (NMSU). Near Atenquique (29 m. NE. of Colima by road), 7 ♂, 23 ♀, xii.3.48, H. B. Leech; this locality is given as Colima, but must be in Jalisco (CAS). Tehetlican, Rd. 10, 2 ♂, vii.28.62; 10 m. S., 2 ♂, 3 ♀, JRZ (NMSU). **MICHOACAN.** Urupan, 10 m. S., 1 ♂, iii.26.64, JRZ (NMSU). **OAXACA.** Juchitan, 3 m. E., 27 ♂, 17 ♀, ix.7.64; 20 km. E., 2 ♂, 4 ♀, ix.7.64; 15 m. of Juchitan on Rd. 185, 2 ♂, 4 ♀, ix.2.63, JRZ (NMSU). La Ventosa, 50 m. N., 1 ♂, xii.14.55, J. C. Schaffner (UMMZ). Matias Romero, 5 m. S., 1 ♀, ix.7.64, JRZ (NMSU). Oaxaca, 4 ♂, 4 ♀, vii.20.37, H. B. Leech (CAS). Salina Cruz, 5 ♂, 5 ♀, ix.6.64; Tapanatepec, 17 ♂, 18 ♀, ix.1.63, JRZ (NMSU). Tehuantepec, 17 ♂, 25 ♀, ix.2.63; 4 ♂, ix.6.64; Texquisixtlan (Rd. 190), 5 ♂, 8 ♀, JRZ (NMSU). Temascal, 1 ♂, 1 ♀, v.25.64 (CAS). **PUEBLA.** Near Maria Andrea, 3 ♂, 1 ♀, ix.10.64, JRZ (NMSU). **TABASCO.** Teapa, 5 m. N., 1 ♀, ix.2.63, JRZ (NMSU). **VERACRUZ.** Acayucan, 1 ♀, viii.6.57, D. R. Lauck (USNM); 20 m. S., 4 ♂, 2 ♀, ix.7.64; 10 m. E., 2 ♀, ix.7.64; Catemaco, 5 ♂, 5 ♀, viii.26.62; Cuitlahuac, 17 ♂, 13 ♀, viii.25.62, JRZ (NMSU); 300+, viii.10-12.64, P. J. Spangler, Jr. (USNM). Huatusco, 25 km. E., 3 ♂, ix.9.64, JRZ (NMSU). Jalapa, 10 m. E., 2 ♀, viii.27.62; J. D. Covarrubia, 1 m. N., 4 ♂, viii.26.62; Martinez de la Torre, 19 ♂, 9 ♀, ix.9.64; Near La Tinaja, 8 ♂, 28 ♀, viii.25.62; Near Garro, 2 ♂, ix.8.64; Papantla, 18 km. E., 3 ♂, 4 ♀, ix.9.64; Paso del Toro, 3 ♀, viii.25.62; 15 km. W., 1 ♂, ix.8.64; Paso de Ovejas, 3 ♂, 8 ♀, viii.27.62, JRZ (NMSU). Poza Rica, 9 m. W., 5 ♂, 3 ♀, viii.27.65, P. J. Spangler, Jr. (USNM.) Puenta Jula, 3 ♂, 13 ♀, xii.18.48, H. B. Leech (CAS). Santiago Tuxtla, 10 km. S., 2 ♂, ix.8.64; Tecolutla, 15 km. S., 1 ♀, ix.10.64, JRZ (NMSU). Veracruz, 1 ♂, Höge (AMNH); 2 ♀, vii.—.59, N. Krauss (CAS). **YUCATAN.** Uxmal, 2 ♂, 1 ♀, xi.25.63, JRZ (NMSU).

NICARAGUA. — Belen Rivas, 4 ♂, 5 ♀, vii.18.57, D. R. Lauck (USNM). Esteli, 3 ♂, 2 ♀, vii.31.67, O. S. Flint (USNM); 9 m. N., 50 ♂, 50 ♀, vii.10.65; La Trinidad, 100+, vii.27.65, P. J. Spangler, Jr. (USNM). Madriz, 6 ♂, 4 ♀, vii.8.57, D. R. Lauck (USNM). Rivas, 10 m. N., 100+, vii.11.65; San Benito, 13 m. N., 34 ♂, 38 ♀, vii.11.65, P. J. Spangler, Jr. (USNM). San

Benito, Managua, 2 ♂, 1 ♀, vii.10.57, D. R. Lauck (USNM). Somoto, 100+, vii.28.65, P. J. Spangler, Jr. (USNM).

PANAMA. — Algarrobos, 9 m. S., 9 ♂, 10 ♀, vii.5.67; Anton, 5.3 m. E., 15 ♂, 17 ♀, vii.6.67, P. J. Spangler, Jr. (USNM). Playa San Carlos, 3 ♂, vii.15.67, O. S. Flint (USNM).

Laccophilus fasciatus rufus Melsheimer, restored name and new status
(Figs. 39-45, 49, 57, 284, 285)

Laccophilus rufus Melsheimer, 1844, p. 28. *Type*: Harvard University, Museum of Comparative Zoology, number 31234, male, Pennsylvania.

Laccophilus fasciatus, Crotch, 1873, p. 400; Sharp, 1882a, p. 290; Blatchley, 1910, p. 210; Leng, 1920, p. 77; Zimmermann, 1920, p. 18; Zimmerman and Severin, 1957, pp. 29-32; Zimmerman, 1960, pp. 142-3.

DIAGNOSIS. — *L. fasciatus* can easily be separated from all other irrorated species in the eastern United States by the fascia or blotch on the posterior half of the elytra.

NOMENCLATURAL NOTES. — Say (1823) recognized *rufus*, but referred to it as a variety of *maculosus* without giving it a name. This race has long been known as *fasciatus;* but, as discussed above, the remaining type is the Mexican subspecies and not an individual from the eastern United States. Melsheimer's *rufus* is restored as valid, since there is no doubt as to the identity of his type in the Museum of Comparative Zoology.

VARIATION. — The principal variation in elytral pattern is shown in Figures 285 and 286. Small specimens with weakened fascias resemble the sympatric *proximus*. This is individual variation, however; and, apparently, has no geographical significance.

Males and females are very nearly the same size, both averaging about 4.74 mm; and measurements have been combined for each locality.

Apparently, there is considerable regional variation in size of *rufus*, while pattern and the PW/EL ratio remain fairly uniform throughout the range.

The average values for all four measurements are much the same for three large samples from Indiana, Illinois, and Kansas (Table 2), but three other samples from the eastern United States give a different picture. Sixty-nine specimens from several southeastern states had a mean length of only 4.68 mm, as compared to 4.73 mm for the three midwestern samples and 4.90 mm and 4.81 mm for New York and

Pennsylvania. *L. f. rufus* appears to be smaller in the southeast than in any other part of the range. The standard deviations were all larger than other comparable samples, which indicates some currently unrecognized difference within southeastern populations.

A cline for all four measurements shows up if the three samples from New York to Indiana are compared. The differences are all significant (95 per cent level and above). This is one of the few clines that have been discovered in this study even though the populations cover large areas.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. f. rufus* ranges from northern Florida and east Texas to Vermont, southern Michigan, and southeastern South Dakota and from the Atlantic Coast to a line approximating the ninety-seventh meridian in South Dakota, Nebraska, Kansas, Oklahoma, and Texas. It normally does not occur in the peninsula of Florida, or the lowlands bordering the Gulf of Mexico; but it has been taken in the vicinity of Mobile Bay. It is probably the most abundant *Laccophilus* south of the glaciated region in the eastern United States. It intergrades with *terminalis* from northcentral Kansas to east Texas.

Young (1954) found *rufus* most commonly in muddy or silty bottomed temporary pools formed in roadside ditches or intermittent streams. These pools were in well-drained soils. It was a pioneer species of recently formed aquatic habitats in upland Florida. Zimmerman (1960) found it in open, unshaded ponds and roadside ditches in clay soils in the Midwest.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ALABAMA.** *Mobile County.* Mobile, 8, J. D. Sherman, Jr. (USNM). *Montgomery County.* Barachias, 2, vi.10.24, E. G. Holt (USNM). *Russell County.* Seale, 1 ♀, vi.18.54, R. L. Fisher, D. L. Haynes (MCHS). **ARKANSAS.** *Grant County.* Poyem, 10 ♂, x.25.48, O. Bryant (CAS). *Hempstead County.* Hope, 1, ix.7.31, Knoble (BERK); 4 ♀, iv.3.22, L. Knoble (CAS); 1 ♂, vi.11.54, J. W. Green (CAS). **CONNECTICUT.** *Fairfield County.* County, 1 ♀, vii.—.—, C. H. Roberts (AMNH). **DISTRICT OF COLUMBIA.** Piney Br., 1, iv.25.05 (USNM); 1, viii.26.06, D. H. Clemons (USNM). Rock Creek, 6, viii.31.06, D. H. Clemons (USNM). Washington, 1, vii.17.—; 1, viii.28.—, Hubbard & Schwarz (USNM); 3, ix.7-23.06, W. L. McAtee (USNM); 1, vi.6.04, F. Knab (USNM); 1, vii.31.—, H. S. Barker (USNM); 3, iv.28.18, L. L. Buchanan (USNM). District 4, —.—.— (USNM). **FLORIDA.** *Duval County.* Jacksonville, 1 ♂, Van Dyke (CAS). **GEORGIA.** *Chatham County.* Savannah, 1, v.17.27, E. W. Mank

(CNL). *Cobb County*. Marietta, 2, iii.5.11 (CNL); 1, iii.5.11 (USNM). *Decatur County*. Bainbridge, 1 ♂, 1 ♀, vii.15-27.09, J. C. Bradley (CAS); 6, vii.15-27.09; 1, iii.7.10, J. C. Bradley (CNL); County, 2, x.3.38, F. N. Young (CNL). *Jefferson County*. Wrens, 2, iii.8.11 (CNL); 1, iii.8.11 (USNM). *Rabun County*. Clayton, 1 ♂, vii.—.10, W. T. Davis (CAS); County, 4 ♂, 3 ♀, vii.—.—, C. V. Leng (CAS). **ILLINOIS**. *Alexander County*. Olive Branch, 8 ♂, 11 ♀, x.8.09, Gerhard (FM). *Bond County*. Mulberry Grove, 6 ♂, 3 ♀, x.20.56, JRZ (NMSU). *Champaign County*. Urbana, 1, vii.19.07 (USNM); 1 ♂, iii.—.— (CNG); Champaign, 2 ♂, 5 ♀, xi.5.27, A. T. McClay (DAV). *Cook County*. (Morton Gr.) Edge Brook, 2, vii.15.11, J. D. Sherman, Jr. (USNM). Glencoe, 2, ix.5.04, J. D. Sherman, Jr. (USNM). Palos Pk., 1 ♀, x.14.34, W. J. Gerhard (FM). *Franklin County*. Zeigler, 1, iii.13.29, J. Karlovich (USNM). *Kankakee County*. Momence, 1, vii.—.—, Wickham (USNM). *Jackson County*. Murphysboro, 3 ♂, 1 ♀, viii.9.32, W. J. Gerhard (FM). *Pike County*. Pittsfield, 3 ♂, viii.17.46, 1 ♂, 2 ♀, viii.7.47; 1 ♂, viii.22.47; 1 ♀, vii.28.48, B. Cadwell (DAV). *Randolph County*. Bremen, 1, vii.19.56, P. J. Spangler, Jr. (USNM). *Vermilion County*. Oakwood, 1 ♂, v.5.48, H. T. McClay (DAV). **INDIANA**. *Brown County*. Brown County St. Pk., 8 ♂, 7 ♀, iv.21.56, JRZ (NMSU). *Clinton County*. Kirklin, 3 m. W., 1 ♂, 1 ♀, ix.12.58; 1 ♂, 1 ♀, ix.26.58; 6 ♂, 6 ♀, x.10.58; 7 ♂, 3 ♀, x.17.58, JRZ (NMSU). *Dubois County*. Purdue Exp. Farm, Near Huntingburg, 5 ♂, 5 ♀, x.29.55, J. E. Hanegan & JRZ (NMSU). *Hamilton County*. Westfield, 7 m. N., 3 ♀, v.4.56, JRZ (NMSU). *Huntington County*. Huntington, 2 m. N., 7 ♂, 9 ♀, x.26.56, JRZ (NMSU). *Knox County*. Hazelton, 10 m. W., 2 ♂, 2 ♀, ix.9.56, JRZ (NMSU). *Lake County*. Clarke, 2 ♀, viii.7.07, (FM). *Madison County*. Alexandria, 5 m. E., 4 ♂, 3 ♀, vii.10.57, JRZ (NMSU). Anderson, 2 ♀, vi.6.57; 2 ♂, vi.21.57, JRZ (NMSU). *Monroe County*. Bloomington, 12 ♂, 12 ♀, ix.15.55; 6 ♂, 10 ♀, ix.20.55; 19 ♂, 4 ♀, iii.13.56; 22 ♂, 29 ♀, iv.26.56; 1 ♂, 6 ♀, v.11.56; 13 ♂, 15 ♀, vii.1.56, JRZ (NMSU); 4 m. N., Slough, 12 ♂, 8 ♀, vi.18.57, JRZ (NMSU); 4 ♂, 7 ♀, xii.31.49, F. N. Young (AMNH); 4, xii.31.49, F. N. Young (CNL); ii.9.52, F. N. Young (CNL); 1 ♂, 1 ♀, xii.31.49, F. N. Young (FM); 1 ♂, 1 ♀, same data (ANSP). *Morgan County*. Waverly, 5 ♀, vi.17.57; Morgan-Monroe St. For., 1 ♂, vii.15.57, JRZ (NMSU). *Noble County*. Wolflake, 5 m. S., 1 ♂, x.26.56, JRZ (NMSU). *Owen County*. McCormick's Ck. St. Pk., 3 ♂, 2 ♀, vii.12.55; Richland Ck., Near Whitehall, 2 ♂, 2 ♀, vii.26.55, JRZ (NMSU). *Posey County*. Mt. Vernon, 5 m. E., 4 ♂, 7 ♀, ix.9.56, JRZ (NMSU). *Wabash County*. Wabash, 3 m. N., 3 ♂, x.26.56, JRZ (NMSU). **IOWA**. *Decatur County*. Leon, 1, vii.3.32, F. Andre (TAM). *Lee County*. Fort Madison, 1 ♀ (AMNH). *Polk County*. Herrold, 1, vii.24.19, E. D. Quirsfeld (CNL). *Story County*. Ames, 1, v.11.32, Floyd Andre (USNM). **KANSAS**. *Atchinson County*. Atchinson, 1 ♂, ix.22.56, J. W. McReynolds (CAS). *Cherokee County*. Galena, 19 (CNL); 19 (USNM); 33, viii.26.04 (USNM); 6 ♂, 11 ♀, Ebb. Crumb (AMNH). *Douglas County*. Baldwin (City?), 3 ♂, 4 ♀, J. C. Bridwell (ORES). Lawrence, 1, x.9.49, J. G. Rozen (BERK); 23 ♂, 25 ♀,

ix.26.—; x.2.51, P. J. Spangler, Jr. (USNM). Lone Star L., 15 ♂, 13 ♀, vi.6-10.52, P. J. Spangler (USNM). County, 2, x.9.48, J. G. Rozen (BERK); 20, iii.20.52; 3, iii.19.52; 1, iii.11.52, P. J. Spangler, Jr. (USNM); 2, F. H. Snow (CNL). *Leavenworth County*. Lawrence, 7 m. NE, 2, iii.22.52, P. J. Spangler, Jr. (USNM). *Ottawa County*. County, 1 ♂, iv.31.33, C. W. Sabrosky (MCHS). *Pottawatomie County*. Onaga, 2 (USNM); Onega (Onaga?), 1 ♂, 2 ♀, F. Crevecoeur (AMNH). *Riley County*. 1, iii.13.—; 1, viii.1.—; 11, x.21.—, Popenoe (USNM). *Shawnee County*. Topeka, 4 (USNM); 3, Hubbard & Schwarz (USNM); 2 ♀, Popenoe (MCZ). **LOUISIANA.** *Natchitoches County*. Coverdale (AMNH); 2 (USNM). Vowell's Mill, 7 ♂, 9 ♀ (CAS). *Vernon County*. Leesville, 1 ♀, viii.18.47, H. S. Fitch (DAV). **MARYLAND.** *Baltimore County*. 1 ♂, vii.13.—, F. E. Blaisdell (CAS). *Harford County*. Edgewood, 2, ix.17.18, H. Dietrich (CNL). *Montgomery County*. Kensington, 36, vi.2-17.61, J. W. Fitzgerald (USNM). Piney Point, 3, viii.26.46, R. I. Sailer (USNM). Plummers Island, 3, v.6.05; 1, iii.24.07; 3, iv.27.13, W. L. McAtee (USNM). **MICHIGAN.** *Van Buren County*. South Haven, 1, viii.11.04 (USNM). *Wayne County*. Detroit, 2, vi.28.—, 2, Hubbard & Schwarz (USNM). **MISSISSIPPI.** *George County*. Lucedale, 5, i.17.32; 4, iii.27.32, H. Dietrich (CNL). *Perry County*. Beaumont, 1, iv.19.32, H. Dietrich (CNL). *Wilkinson County*. Woodville, 1 ♂, vii.26.21 (CAS). **MISSOURI.** *Boone County*. Ashland, 1, iii.29.56, P. J. Spangler, Jr. (USNM). Columbia, 10, iii.21-29.36; 3, v.2.36, W. M. Gordon (CNL); 3, vi.26.—, Wickham (USNM). Columbia, 5 m. S., 1, viii.20.53, M. C. Grabeau (USNM). Deer Park, 6 m. E., 1, viii.28.53, M. C. Grabeau (USNM). *Cooper County*. Booneville, 1 m. E., 6, ix.25.54, P. J. Spangler, Jr. (USNM). *Girardeau County*. Cape Girardeau, 1, iv.1.56, D. Stout (USNM). *Greene County*. Springfield, 1, xii.11.49, E. T. Oxtman (BERK). *Mississippi County*. Charleston, 1, iv.23.56, P. J. Spangler, Jr. (USNM). *St. Louis County*. Howard Bend, 7, vi.28.37; 7, vii.17.37; 2, vii.22.40; 1, ix.18.40, W. M. Gordon (CNL). Manchester, 1, ix.15.57, P. J. Spangler, Jr. (USNM). St. Louis, 1, M. Schuster (USNM). Webster Grove, 1, vi.27.33, R. C. Lange, (USNM). *Vernon County*. Near Nevada, 1 ♂, 3 ♀, v.14.58, J. W. McReynolds (CAS). Nevada, 1 ♂, 1 ♀, vi.11.58, J. W. McReynolds (CAS). County, 1 ♀, v.30.58, J. W. McReynolds (CAS). **NEBRASKA.** *Lancaster County*. Lincoln, 2 ♂, 3 ♀, x.15.60, W. F. Rapp, Jr. (NMSU). **NEW JERSEY.** *Bergen County*. Fort Lee, 7, vii.30.04, J. D. Sherman, Jr. (USNM). Palisades (Pk.?), 1, iv.19.03, T. D. O'Connor (CNL). County, 4, v.11.02, Shoemaker (USNM). *Camden County*. Delair, 3 ♂, 4 ♀, vii.16.—, E. L. Dickerson (AMNH). *Middlesex County*. Avenel, 1 ♀, v.22.31, Siepmann (FM). Spotswood, 1 ♀, C. H. Roberts (AMNH). *Morris County*. Boonton, 1, vii.8.01, G. M. Greene (USNM). *Ocean County*. Ft. Dix, 1 ♂, vi.10.43, C. D. Michener (AMNH). Lakehurst, 1, vi.26.54, D. M. Anderson (CNL); 1, ix.1.01, J. D. Sherman, Jr. (USNM); 4 ♂, 3 ♀, vii.17.23, L. B. Woodruff (AMNH); 1 ♀, v.24.—; 1 ♂, vii.31.—, C. H. Roberts (AMNH). **NEW YORK.** *New York Vicinity*. Staten Is., 1 ♂, Leng, Van Dyke (CAS); 1; 1, vii.—.91; 17, ix.15.00, J. D. Sherman, Jr. (USNM); 1 ♀, ix.27.38; 1 ♀, x.1.38; 1 ♀, ix.4.39; 1 ♀, v.14.39; 1 ♂, 1 ♀,

iv.23.39 (FM); 2 ♀, iv.19.—, C. H. Roberts (AMNH); 1 ♀, ix.27.38 (DAV). N.Y.C., 1 ♂, 1 ♀, C. H. Roberts; 1 ♂, x.24.01 (AMNH). *Westchester County*. Peekskill, 1, J. D. Sherman, Jr. (USNM). **NORTH CAROLINA.** *Buncombe County*. Ashville, L. Ashnoca, 1, iv.29.44, W. E. Hoffman (USNM); 1, v.—.44, W. E. Hoffman (USNM). Ashville, 1 ♀, ix.—.95 (AMNH). Black Mts., 2 ♂, v.17.— (AMNH). *Madison County*. Hot Springs, 1 ♀ (MCZ). *Polk County*. Columbus, 1, vi.19.52; 1, vii.14-21.52 (USNM). *Guilford County*. Greensboro, 1, viii.9.—, F. C. Pratt (USNM). **OHIO.** *Athens County*. Athens, 2, x.9-15.49; 3, vi.22-30.50. Waterloo Tnsp., 1, iv.23.50; 2, vi.27.50; 2, vii.6.50, P. J. Spangler, Jr. (USNM). *Hamilton County*. Cincinnati, 1, viii.17.—, H. Soltau (USNM). *Richland County*. Mansfield, 1 ♀ (ORES). *Ross County*. Londonderry, 2, viii.5.50, P. J. Spangler, Jr. (USNM). *Scioto County*. Near Friendship, Roosevelt Lake, 3, vii.29.50, P. J. Spangler, Jr. (USNM). *Vinton County*. Lake Hope, 2 ♂, 1 ♀, vii.22.52, W. C. Stehr (CAS); 1, x.7.58, W. C. Stehr (NL). *Warren County*. Mason, 2 m. S., 12 ♂, 7 ♀, vi.24.57, J. R. Zimmerman (NMSU). **OKLAHOMA.** *Atoka County*. Atoka, 1 ♀, vi.13-15.—, Wickham & Fenyes (CAS); 1, vi.13-15.—, Wickham (USNM). *Bryan County*. Lake Texoma State Park, 2 ♂, 2 ♀, vi.24.62, E. Van Tassel (CNA). *Marshall County*. 1, vi.5.53; 1, viii.5.53 (USNM). *Ottawa County*. 1 ♂, vi.5.31, Costner & Davis (MCHS). *Payne County*. Stillwater, 1 ♂, 1 ♀, ii.10.38, K. C. Emerson (MCHS). *Pittsburg County*. McAlester, 1 ♂, vi.11.—, Wickham & Fenyes (CAS); 3, vi.11.—, Wickham (USNM). **PENNSYLVANIA.** *Adams County*. Arendtsville, 1, viii.4.51, P. J. Spangler, Jr. (USNM). Starrs Mill, 1, vi.15.49, P. J. Spangler, Jr. (USNM). *Allegheny County*. Pittsburgh, 3 ♂, 4 ♀; 1 ♂, vi.14.—; 2 ♀, vii.—.—; 1 ♀, viii.—.—; 1 ♀, ix.2.—; 1 ♀, ix.4.— (CNG). County, 4, iv.5.90, E. A. Klages (CNL); 3 ♂, 8 ♀ (CNG). *Delaware County*. 1 ♂, v.18.— (ANSP). *Franklin County*. Chambersburg, 1, x.1.—; 2, J. D. Sherman, Jr. (USNM). *Juniata County* (?). Path (Valley?), 8, J. D. Sherman, Jr. (USNM). *Lebanon County*. Lebanon, 10, J. D. Sherman, Jr. (USNM). *Philadelphia County*. Philadelphia, 2 (USNM). Philadelphia? Neck, 1 ♂, 2 ♀, v.12.—, Blaisdell (CAS). Phila. Neck, 2 ♂, Laurent (AMNH); 2 ♂, 7 ♀, v.4.—; 1 ♂, 4 ♀, ix.13.— (ANSP); 1; 1, vii.15.04; 1, v.2.—, Kaeber (USNM); 2, vi.9.00; 1, ix.13.—, G. M. Greene; 2, P. Lauren (USNM). *Westmoreland County*. Jeannette, 1 ♂, 5 ♀, vii.—.—; 1 ♂, vii.3.—; 1 ♀, vii.4.—; 6 ♀, vii.14.—; 1 ♀, vi.21.—; 1 ♂, 1 ♀, vi.24.—; 2 ♂, 3 ♀, vi.27.— (CNG). **SOUTH CAROLINA.** *Beaufort County*. Beaufort, 4 ♂, 3 ♀; 2 ♂, iv.12.92; 1 ♂, iv.18.92, G. D. Bradford (AMNH). *Kershaw County*. Camden, 4 ♂, 1 ♀, vi.23.29, P. J. Darlington, Jr. (MCZ). *Pickens County*. Clemson, 2, xi.25.27, D. Dunavan (USNM). **TENNESSEE.** *Davidson County*. Nashville, 1, viii.4-15.97, Wickham (USNM); 1, Osburn (USNM). *Fentress County*. Ailardt, 1 ♂, viii.17.22, T. H. Hubbell (MCHSU). *McMinn County*. Athens, 1 ♀, vi.24.63, A. R. Moldenke & J. A. Woods (AMNH). *Shelby County*. Memphis, 1 ♂, v.16.12, Blaisdell (CAS). **TEXAS.** *Brazos County*. College Station, 1, iii.31.35, H. J. Reinhard; 1, vii.19.59, H. R. Burke (TAM). *Collin County*. Plano, 1, vii.—.07, E. S. Tucker (USNM). *Harris County*.

Houston, 5, vi.15.32, Harwood (CNL). *Harrison County.* Karnack, 4 ♂, 7 ♀, vi.17.58, R. L. Fischer, J. Eichmeier & R. A. Schneibner (MCHS). *Panola County.* Carthage, 1 ♂, v.8.52, M. Cazier, W. Gertsch & R. Schrammel (AMNH). **VIRGINIA.** *Albemarle County.* Ivy (Depot?), 5 ♀, vi.—.33, F. E. Winters (CAS). *Alexander County.* 1, vi.18.10; 1, vii.7.08 (USNM). *Bath County.* Warm Springs, 1 ♀, x.1.—, Leng & Van Dyke (CAS). *Fairfax County.* Great Falls, 2, i.9.06; 1, iii.17.07, D. H. Clemons (USNM). County, 2, ix.20-22.27, Shoemaker (USNM). *Henrico County.* Richmond, 4 ♂, Slossom (AMNH); 1 ♀ (MCZ). *Nansemond County.* Suffolk, 10 ♂, 6 ♀, vi.27.1876, Dimwock (MCZ). *Nelson County.* 5, viii.6.16, W. Robinson (USNM). *Nottoway County.* Camp Pickett, 2 ♂, 1 ♀, v.1.52, B. Adelson (CAS). *Spotsylvania County.* Fredericksburg, 1, iii.16.89; 3, iii.15.91; 2, x.4.97; 3, iii.19-26.99, W. D. Richardson (USNM); 3, ix.—.98, J. D. Sherman, Jr. (USNM); 1 ♂, 1 ♀, ii.—.22 (AMNH). **VERMONT.** *Bennington County.* County, 1 ♂, 1 ♀, vii.—.94, C. H. Roberts (AMNH); 1 ♀ (ASNP). **WEST VIRGINIA.** *Greenbriar County.* White Sulphur Springs, 1 ♀, vii.—.—, A. Fenyes (CAS); 10, viii.23.10, W. Robinson (USNM). *Jackson County.* Ripley, 3, vi.25.30, F. N. Musgrave (CNL). *Jefferson County.* Harper's Ferry, 4, ix.12.17, J. E. Benedict, Jr. (USNM). *Kanawha County.* County, 2 ♂, 3 ♀, vii.—.35 (CNG).

Laccophilus fasciatus terminalis Sharp, new status

(Figs. 46, 48, 53, 282, 283)

Laccophilus terminalis Sharp, 1882a, p. 292. *Type*: British Museum (Natural History), female, Texas; type locality here restricted to Davis Mountains, Jeff Davis County, Texas; Sharp, 1882b, p. 11; Horn, 1883, p. 277; Horn, 1894, p. 313; Leng, 1920, p. 77; Zimmermann, 1920, p. 26; Leech, 1948b, p. 402-3; Leech and Chandler, 1956, p. 314; Zimmerman and Severin, 1957, p. 30.

DIAGNOSIS. — The elytral pattern serves as the best recognition character for *L. f. terminalis.* The irrorated dots are sparsely applied, and the pattern outline is distinctly margined with dark brown or black. On the posterior half, there is a tendency to form a fascia or blotch similar to *rufus* and *fasciatus.* It is never complete, however, and, in some specimens, the pigment is restricted to patches just behind the mid-lateral spots. Megascopically *terminalis* often has a checkered appearance. Small individuals of *L. sonorensis* resemble *terminalis,* but they are not irrorated. The male lacks a file, and the female has rakelike ovipositor. Some specimens of *mexicanus* and *salvini* have a tendency to form a dark blotch on the posterior half of the elytra, but are black beneath (except female *mexicanus atristernalis* in coastal California and Oregon).

NOMENCLATURAL NOTES. — There appears to be no synonymical problems in this race, but it is reduced to subspecies since it intergrades with *fasciatus* and *rufus.*

VARIATION. — This race poses one problem in that the elytral pattern can vary markedly from the usual pattern. There is a gen-

eral fading that causes some difficulty in recognition. The basic ground pattern remains, however. The fading is most common in individuals from the southwestern United States.

More population data was accumulated for this race than any other in the study. Size and the PW/EL ratio is the same for males and females. The average size (4.8 mm) is larger than for *fasciatus* and most *rufus* populations (Table 2). There is considerable geographic variation in size. Central and south Texas populations are about the same as midwestern *rufus*, but are smaller than other *terminalis* to the west and south. Populations from northern New Mexico south to Durango, Mexico, and from west Texas to California appear to be much the same. South and east of Durango, however, there is an increase in size. From Linares, Nuevo Leon, to Jalisco, the populations have an average length of almost 4.92 mm which is 0.05 to 0.10 mm larger than in other parts of the range. One exception is a single large sample from about the middle of the Baja California peninsula which is equally long (4.95 mm). Farther south around La Paz, the value is about the same as that found from New Mexico to California.

It seems that while *terminalis* retains a fairly uniform pattern (except for fading) and shape throughout its range, it is still undergoing considerable change in size from one region to another. This should not be surprising, since it covers an area with so much physiographic contrast and climatic variation. About the only uniform feature in its distribution is the preference for an aquatic habitat in an arid environment. It is perhaps more difficult to understand why other *Laccophilus* which cover equally diverse areas (for example, *L. maculosus decipiens* and *L. maculosus shermani*) do not show this degree of variation.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. f. terminalis* occurs from southwestern South Dakota to Jalisco. Its eastern boundary approximates the ninety-seventh parallel where it is replaced by *rufus*. From South Dakota the limits swing sharply south and westward to the Rocky Mountains; and its northwestern boundary is through central New Mexico, Arizona, and southern California. Outlying localities are known from North Dakota, northern and southwestern Utah, Marin County of California, and southwest Oregon. Numerous other collections in the intervening areas have

not yielded additional records, however. It apparently occurs throughout Baja California, and its southern limits are fairly well defined by the Mexican Plateau and the central Mexican Highlands.

It is probably the most common *Laccophilus* (and any other dytiscid) in the southwestern United States and northern Mexico. It occurs in practically any small aquatic habitat and, apparently, migrates very readily since it often appears in street gutter pools within a few days after a rain. *L. f. terminalis* is usually in heavier clay or adobe soils that are exposed to bright sun and have considerable debris; it can also be found in small, sluggish, streams. It ranges from sea level to about 6000 feet, but may occasionally be taken above that elevation.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ARIZONA.** *Cochise County.* Benson, 2 m. E., 2 ♂, 8 ♀, x.6.63; 4 m. W., 4 ♀, x.6.63, K. L. McWilliams (NMSU); 5 ♂, 2 ♀, ii.25.33, O. Bryant (CAS). Douglas, 2 ♂, 1 ♀, iii.15.33, W. W. Jones (BERK). Fairbank, S. Pedro R., 6, iii.12.36, J. G. Needham (CNL). Huachucha City, 8 ♂, 17 ♀, ix.6.61, JRZ (NMSU). Huachucha Mtns., 13, v.7-8.53, A. & H. Dietrich (CNL); 4 ♂, 4 ♀, Barber (AMNH). Portal, 5 m. W., SWRS., 1 ♂, vi.20.55, M. Statham; 2 ♂, x.1.55, M. Cazier; 9 ♂, 5 ♀, x.21.55, E. Ordway; 1 ♀, iv.3.56; 1 ♂, iv.12.56; 1 ♀, iv.21.56, E. Ordway; 1 ♂, v.4.56, M. Statham (AMNH); 2 ♂, 2 ♀, x.21.55, E. Ordway (UMMZ) comp. with type in BM(NH) by FNY; 5 m. SWRS., 8 ♂, 12 ♀, —.—.—, L. B. Bartholomew (NMSU); 2 m. NW. Rodeo, New Mexico, 3 ♂, ix.5.61, JRZ (NMSU). St. David, 2 ♂, 2 ♀, vii.—.44, G. E. Pickford (FM); 2 ♂, 2 ♀, vii.15.44, G. E. Pickford (CAS). Tombstone, 5 m. N., 3 ♂, 8 ♀, ix.6.61, JRZ; Willcox, 11 m. W., 5 ♂, 1 ♀, x.6.63, K. L. McWilliams (NMSU). *Gila County.* Globe, Pinal Ck., 75, iv.25.53, A. & H. Dietrich (CNL); 1 ♂, 1 ♀, x.13.48, F. H. Parker (CAS). Rice (San Carlos R. Res., R. R. Sta.), 4, vii.9.31, D. Parker (CNL). *Graham County.* Near Artesia, rd. to Marijilda Canyon from Hwy. 666, 4 ♂, 1 ♀, vii.3.65, H. B. Leech (CAS). Pima, 2, x.21.24, A. A. Nichol (ARI). Pinalena Mtns., Hospital Flat, 1 ♀, viii.3.65, H. B. Leech (CAS). *Maricopa County.* Gila Bend, 1, xii.13.45, H. P. Chandler (BERK). Phoenix, 1, vi.23.94, J. D. Sherman, Jr. (USNM); 44 ♂, 51 ♀, Kunze (AMNH); 1 ♀, v.31.40, G. P. MacKenzie (AMNH). Wickenburg, 2 ♂, 5 ♀, iv.16.62, JRZ (NMSU); 5 m. E. Hassayampa R., 1 ♂, 1 ♀, iv.2.66, J. Schuh (SCH). *Pima County.* Ajo Mtn., Alamo Can. (OPCNM), xii.19.39, C. F. Harbison (BERK). Ajo, 2 ♀, viii.31.55, P. S. Bartholomew (CAS). Catalina Mtns., 9, iv.18.—, Hubbard & Schwarz (USNM); 1, H. & S. (USNM); Lowell Ranger Sta., 1, vii.6-20.16, J. D. Sherman (USNM); 2, x.21.24, A. A. Nichol (ARI); Bear Can., Molino Basin, 2, iv.18.—, v.20.53, A. H. Dietrich (CNL). Florida, 1, xi.18.39, P. Lightle (ARI). Madera Can., 1 ♂, 1, ix.2.54, Menke & Stange (DAV). Pantano, Cienega Ck., 6, iii.25.53, A. H. Dietrich (CNL). Quitobaquito, OPC, Ntl. Mon., 12, iv.11.53; 2, vi.—.53, A. & H.

Dietrich (CNL). Santa Rita Mtns., Florida Can., 3, iv.19.59, F. G. Werner (ARI); 2 ♂, 4 ♀, ix.7.61; 7 ♂, 7 ♀, xii.2.61; 1 ♀, viii.6.62, JRZ (NMSU). Sta. Rita Mtns., 1 ♀, vii.25.41, O. Bryant (CAS). South Catalina Mtns., 2 ♂, 1 ♂, iv.10.38, F. H. Parker (DAV). Sta. Catalina Mtns., 2 ♀, x.21.24, A. A. Nichol; 1 ♂, 1 ♀, v.8.33, O. Bryant; 2 ♂, xi.20.33, O. Bryant; 1 ♂, 6 ♀, i.2.38, Van Dyke; 1 ♂, 1 ♀, v.16.39, E. P. Van Duzee (CAS). Tanque Ck., 1, iii.14.36, J. G. Needham; 8, iii.28.53, A. & H. Dietrich (CNL). Tanque Verde, 32 ♂, 42 ♀, vii.25.61, JRZ; Tucson, 15 m. NE., 1 ♂, x.5.63, K. L. McWilliams (NMSU); 10 ♂, 5 ♀, vi.1.33, O. Bryant; 4 ♂, iii.22.33, O. Bryant; 3, iv.25.—, Hubbard & Schwarz (USNM); 1 ♂, iv.15.33, O. Bryant (CAS); 20 m. E., 3 ♂, 1 ♀, ii.16.66, J. D. Vertree (SCH); 1 ♂, 2 ♀, iv.5.97, Koebele (CAS); 2 ♀, ix.—.28, F. H. Parker (CAS); Sabino Can., 1, x.31.18, A. G. Boring (USNM). *Pinal County*. Aravaipa Can. (Near Mammoth), 1, v.21.53, A. & H. Dietrich (CNL). Picacho, 2 ♂, 3 ♀, iv.19.33, O. Bryant (CAS). *Santa Cruz County*. Nogales, 1 ♂, 1 ♀, iv.—.97, Koebele (?) (CAS); 5 m. N., 13 ♂, 9 ♀, ix.6.61, JRZ (NMSU). Patagonia, 1, v.26.53, A. & H. Dietrich (CNL); 1 ♂, 1 ♀, ix.17.52, B. Malkin (FM); 3 m. S., Sonoita Ck., 1 ♂, 1 ♀, ix.6.61, JRZ (NMSU). Pena Blanca L., Coronado Ntl. For., 6 ♂, ix.6.61, JRZ (NMSU); 1, iv.4.66, J. Schuh (SCH); Pajarito Mtns., 3 ♂, 1 ♀, vii.1.61; 1 ♂, 2 ♀, viii.14.61; 14 ♂, 9 ♀, vi.28.62; 1 ♀, vii.3.62; 3 ♂, 1 ♀, vii.6.62; 1 ♂, vii.12.62; 14 ♂, 10 ♀, vii.19.62; 1 ♂, 2 ♀, vii.20.62; 1 ♂, vii.24.62; 1 ♂, vii.25.62; 1 ♀, viii.8.62; Arnett & Van Tassel (CUA). *Yavapai County*. Bloody Basin, 2 ♂, vi.8.47, F. H. Parker (CAS). Castle Hot Springs, 3 ♀, iv.5.42 (AMNH). Minnehaha, 38 (USNM); 11 ♂, 18 ♀, Barber (AMNH). Prescott, 7, J. D. Sherman, Jr. (USNM); 5 ♂, 10 ♀, vii.—.—, Hulst (AMNH); 1 ♀ (ANSP). *Yuma County*. County, 2 ♀, vi.—.— (LACM). **CALIFORNIA.** *Los Angeles County*. Long Beach, 3 ♂, 6 ♀, viii.—.11 (FM). *Imperial County*. Brawley, 3, viii.8.14, J. C. Bradley (CNL). Desert Shores, 2 m. S., 1 ♀, iv.24.62, JRZ (NMSU). Imperial, 1, iv.24.25 (BERK); 1 ♂, 1 ♀, same data (CAS). Imperial County, 2 ♂, 6 ♀, v.25.25, J. J. Gehring (?) (MCZ); 2 ♂, 4 ♀, iv.3.24 (CNG). Inyo County, China Ranch, SE. Tecopa, 2 ♂, iii.23.67, H. B. Leech (CAS). *Marin County*. Marin County, 1, x.18.19, H. Dietrich (CNL). *Mono County*. Mammoth, 3 ♂, 5 ♀, viii.17.52, PSB (CAS). *Orange County*. Laguna Can., 3 ♀, ii.14.59, M. E. Irwin (DAV). Corona del Mar, 1 ♂, 1 ♀, xii.27.58, M. E. Irwin (DAV). Lower San Juan Cpgd., 1 ♂, xi.6.54, Menke & Strange (DAV). *Riverside County*. Blythe, 3 ♂, 2 ♀, iv.17.62, JRZ (NMSU). Camp Pendleton, 1, x.23.45 (BERK). Riverside, 7, F. E. Winters (CNL). *San Bernardino County*. Earp, 10 m. NE., 4 ♂, 7 ♀, viii.16.63, C. D. MacNeill (CAS). *San Diego County*. Borrego, 1 ♂, 1 ♀, x.28.39, G. P. Mackenzie (LACM). Borrego Val., Frenchy's Well, 1 ♀, i.2.35, H. J. Rayner (CAS). Descanso, 1 ♂, ix.23.52, B. Malkin (FM). Escondido 12 m. N., 5, ii.20.55, 1, ix.21.54, R. K. Benjamin (USNM); 10 m. N., 1, xii.17.54, Scissors Crossing, San Felipe Ck., 1 ♂, 1 ♀, iv.15.65, H. B. Leech (CAS). Warner's (Springs?), 2 ♂, 4 ♀, vi.18.25, J. G. Gehring? (MCZ). *Yuba County*. Marysville, viii.1.34, R. Wagner (CAS). **COLORADO.** *El Paso County*. Nr. Palmer

Lake, 1 ♀, viii.15.61, JRZ (NMSU). *Kiowa County*. Eads, 8 m. S., 4 ♂, 1 ♀, ix.11.63, K. L. McWilliams (NMSU). *Lincoln County*. Hugo, 8 m. SE., 1 ♂, ix.11.63, K. L. McWilliams (NMSU). *Sedgwick County*. Ovid, 1 ♂, 1 ♀, viii.17.61, JRZ (NMSU). **KANSAS**. *Gray County*. Cimarron, 3 ♂, 1 ♀, viii.22.56, P. J. Spangler (USNM). *Hamilton County*. Syracuse, 7 m. E., 2 ♂, 1 ♀, ix.11.63, K. L. McWilliams (NMSU). *Seward County*. Liberal, 4 ♂, 5 ♀, viii.12.58; 3 m. N., 2 ♂, 3 ♀, viii.12.58; Near Kismet, Cimarron R., 1 ♀, viii.12.58, JRZ (NMSU). **NEBRASKA**. *Lincoln County*. North Platte, 10 m. W., 1 ♀, viii.17.61, JRZ (NMSU). **NEW MEXICO**. *Colfax County*. Cimarron, 10 m. N., 1 ♂, vii.15.65, A. H. Smith; Near Maxwell, 1 ♀, viii.14.61, JRZ; Raton, 1 ♀, vii.5.63, R. N. Gennaro; 7 m. E., 1 ♂, vii.15.65, A. H. Smith (NMSU). *Dona Ana County*. Hatch, 1 ♂, 1 ♀, xii.14.45, H.P. Chandler (FM); 7 m. W., 4 ♂, 4 ♀, iv.20.62; Jornado del Muerto, 15-20 m. N. of Las Cruces, Taylor Wells, 3 ♂, 4 ♀, vii.28.63; Jornado Range, 1 ♂, 4 ♀, vii.20.63; Ropes Springs, 3 ♂, 11 ♀, xi.18.63, K. L. McWilliams; Las Cruces, 6 ♂, 2 ♀, vii.5.61; 2 ♂, vii.9.61; 3 ♀, vii.10.61, JRZ; 14 ♂, 12 ♀, vii.6.61, E. E. Staffeldt & JRZ; 1 ♂, x.1.62, K. L. McWilliams (NMSU); 10 m. E., Organ Mtns., 5 ♂, 3 ♀, viii.7.65, H. B. Leech (CAS). Mesilla, 1 m. SW., 3 ♂, 3 ♀, vii.6.61; 1 ♂, 2 ♀, vii.13.61; 6 ♂, 5 ♀, vii.13.61, JRZ (NMSU). *Eddy County*. Queens (El Paso Gap), 2, xi.9.14, E. G. Holt (USNM). *Grant County*. Hurley, 13 ♂, 2 ♀, vii.17.61; Lordsburg, 13 m. E., 3 ♂, 2 ♀, x.6.63, JRZ; Silver City, 10 m. W., 1 ♂, 2 ♀, vii.16.63, R. D. Ohmart (NMSU). *Guadalupe County*. Santa Rosa, 1 ♂, 1 ♀, viii.24.57, D. Lauck (USNM); 20 m. SE., 12 ♂, 13 ♀, vii.29.63, R. D. Ohmart; 5 m. NE., 3 ♂, 5 ♀, ix.10.63, K. L. McWilliams (NMSU). *Harding County*. Mosquero, 10 m. E., 32 ♂, 25 ♀, x.23.65, A. H. Smith (NMSU). *Hidalgo County*. Animas, 5 m. S., 16 ♂, 11 ♀, vii.24.61, JRZ; 12 m. SE., 115 ♂, 91 ♀, xi.23.62, K. L. McWilliams (NMSU); 8 m. S., 2 ♀, vii.31.65, H. B. Leech; 15 m. S., 1 ♀, vii.31.65, H. B. Leech (CAS). Cienega Lake (Nr. Rodeo), 2 ♀, vii.17.64, R. H. Arnett, Jr. & E. Van Tassel (CUA). Double Adobe Rnch., Animas Mts., 5500 feet, 2 ♂, 3 ♀, viii.15.52, H. B. Leech (CAS). Gary, 5 m. W., 7 ♂, 2 ♀, vii.24.61, JRZ; Lordsburg, 12 m. W., 4 ♀, x.6.61, K. L. McWilliams; Nr. Cloverdale, 6 ♂, 6 ♀, vii.24.61; Roadforks, 2 ♂, 5 ♀, ix.5.61; Rodeo, 12 m. N., 18 ♂, 7 ♀, ix.5.61, JRZ (NMSU). *Lincoln County*. Alto, El. 7000 feet, 7 ♂, 10 ♀, vii.27.61, JRZ; Carrizozo, 13 m. NE., 2 ♂, 5 ♀, ix.10.63, K. L. McWilliams (NMSU). Angus, Rio Bonito, 1 ♂, viii.7.65, H. B. Leech (CAS). *Luna County*. Columbus, 1 m. S., 11 ♂, 12 ♀, vii.17.61, JRZ (NMSU). Deming, 15 m. S., 2 ♂, 4 ♀, vii.17.61; 15 m. NW., 4 ♂, 2 ♀, vii.17.61, JRZ (NMSU); 16 m. W., 2 ♂, 3 ♀, x.6.63, K. L. McWilliams (NMSU). *Mora County*. Mora, 10 m. S., 4 ♂, 8 ♀, v.1.66, A. H. Smith (NMSU). *Otero County*. Alamogordo, 1 ♂, V. Krockow (AMNH). Pinon, 40 m. S., 10 ♂, 2 ♀, vii.29.63, R. D. Ohmart (NMSU). *Quay County*. San Jon, 1 ♂, 1 ♀, ix.10.63, K. L. McWilliams (NMSU). Tucumcari, 10 m. W., 1 ♀, ix.10.63, K. L. McWilliams (NMSU). *Rio Arriba County*. Canjilon, 3 m. W., 1 ♂, 2 ♀, ix.25.65, A. H. Smith; El Rito, 1 ♂, vi.23.65; Ojo Caliente, 1 ♀, vi.23.65, A. H. Smith, R. L. Smith, & JRZ; Velarde, 4 ♂, 1 ♀, vi.22.65, A. H. Smith (NMSU). *Roosevelt County*.

Causey, 1 ♂, 3 ♀, viii.3.65, J. E. Sublette (ENMU). *San Miguel County.* Las Vegas, 1, ii.2.02 (CNL). Mosquero, 19-20 m. W., 37 ♂, 31 ♀, x.23.65; Trujillo, 19 m. E., Tremintina Ck., 39 ♂, 36 ♀, x.23.65, A. H. Smith (NMSU). *Sierra County.* Hillsboro, 4 m. E. (label says Pedra R. Gorge, but must mean Percha Ck.), 3 ♂, 2 ♀, viii.31.52, B. Malkin (FM). Kingston, 5 m. E., 1 ♀, v.27.66, JRZ (NMSU). *Socorro County.* Nr. Bingham, 1 ♀, vii.21.62, R. D. Ohmart (NMSU). *Taos County.* Taos, 4 m. E., 2 ♀, vii.14.64, A. H. Smith (NMSU). *Torrance County.* Corona, 5 m. NE., 1 ♂, 3 ♀, ix.10.63, K. L. McWilliams (NMSU). *Union County.* Pasamonte, 8 m. E. & 2 m. N., 2 ♂, 1 ♀, vii.15.65, A. H. Smith (NMSU). **NORTH DAKOTA.** *Barnes County.* Valley City, 1, iii.—.18, Gabrielson (USNM). **OKLAHOMA.** *Cleveland County.* Norman, 1 ♀, iv.18.19 (CAS). *Grady County.* Chickasha, 1, vii.15.15, W. H. Larrimer (USNM). *Texas County.* Guymon, 3 m. NE., 4 ♂, 4 ♀, ix.11.63, K. L. McWilliams (NMSU). **OREGON.** *Jackson County.* Rogue River, 2, ix.—.02, C. R. Biederman (USNM). **SOUTH DAKOTA.** *Pennington County.* Hill City, 1 ♀, viii.5.35, A. Thrupp (NMSU). **TEXAS.** *Bell County.* Ft. Hood, 5, vii.19.55, T. Matthews (CNL). *Bexar County.* Ft. Sam Houston, 1 ♂, vii.13.52, B. J. Adelson (LACM); 1 ♂, vi.—.52, B. J. Adelson (CAS). Leon Ck., 10 ♂, 3 ♀, x.11-12.52, B. J. Adelson (CAS). San Antonio, 2 ♂, 1 ♀, Wickham (CNG). *Blanco County.* Cypress Mill, 2, ix.10.88; 5 (USNM); 1 ♂, 1 ♀, same date (CAS). Round Mtn., 2, Kaeber (USNM); 3 ♀ (MCZ). Shovel Mtn., 6 ♂, 5 ♀, F. G. Schaupp (AMNH); 9 (USNM). *Brewster County.* Alpine, 20 m. S., 2 ♀, v.12.27, J. D. Martin (CAS); 1, vii.20-22.— (USNM); 1, vii.1-15.26, B. C. Pooling (CNL); 3 ♀ (MCHS). B.B.N.P., Chisos Mtns., 1 ♂, vii.3.42, H. A. Scullen (ORES); 4 ♂, 1 ♀, ix.5-6.52, B. Malkin (FM); 7 m. W., Chisos Junct., 5 ♂, 5 ♀, viii.3.61, JRZ (NMSU). Boquillas, 1 ♀, vii.7.48, C. & P. Vaurie (AMNH); 7 ♂, 7 ♀, viii.2.61, JRZ (NMSU). Chisos Mtns., 1, x.12.08, Mitchell & Cushman (USNM). Marathon, 10 m. E., 5 ♂, 12 ♀, viii.1.61, JRZ (NMSU); 6 ♂, 6 ♀, ix.12.49, O. Bryant (CAS). County, 1 ♂, 1 ♀, v.3.27, J. O. Martin (CAS). *Burnett County.* 8, Hubbard & Schwarz (USNM). *Cameron County.* Brownsville, 1, iv.13.95, Townsend (USNM); 7, iii.5.04, H. S. Barber (USNM); 2, vii.—.—; 2 (USNM); 1 ♂, Wickham (ORES); 3 ♂, 3 ♀, Wickham (MCZ). Esperanza Ranch, 4, viii.19.— (USNM). Port Isabel, 1 ♂, 2 ♀, x.20.49, O. Bryant (CAS). *Culberson County.* Nickel Ck. Sta., 2.5 m. E., 21 ♂, 22 ♀, ix.2.52, B. Malkin (FM). Van Horn, 1 ♂, vii.10.50, R. F. Smith; 1 ♂, vii.10.48, C. & P. Vaurie (AMNH). *Edwards County.* Camp Wood, 2 ♂, 2 ♀, iii.8.33 (TAM). *El Paso County.* Clint, 1 m. SW., 17 ♂, 6 ♀, vii.19.61, JRZ (NMSU). El Paso, 9, vii.28.14, J. C. Bradley (CNL); 3 ♂, 1 ♀ (AMNH); 1 ♂, 2 ♀ (ANSP). *Falls County.* Reagan (Wells?), 5, iii.6.36, J. G. Needham (CNL). *Goliad County.* County, 1, viii.17.—, J. D. Mitchell (USNM). *Gonzales County.* Harwood, 1, Wickham (USNM). *Harris County.* Houston, 1, Wickham (CNL). *Hays County.* Dripping Springs, 1 ♂, viii.9.42, W. S. & E. S. Ross (CAS). *Hidalgo County.* Edinburg, 7, ii.24.36, J. G. Needham (CNL). *Hudspeth County.* Dell City, 9 m. SW., 1 ♂, vii.31.50, R. F. Smith

(AMNH). Ft. Hancock, 5 ♂, 3 ♀, vii.19.61, JRZ (NMSU). *J. Davis County.* Davis Mountains, Limpia Cn. Ck., 3 ♂, 6 ♀, iv.19.53, B. Adelson & M. Washbauer (BERK); 2 ♂, 8 ♀, v.9.51, O. Bryant; 1 ♂, vi.26.46, Van Dyke (CAS); 1 ♂, 1 ♀, viii.3.61; Madera Cn. Ck., 1 ♀, viii.3.61; 10 ♂, 2 ♀, x.27.61, JRZ (NMSU); Elbow Cn. Ck., 7 ♂, 12 ♀, x.27.61; Phantom Lake, 2, vi.20.16, F. M. Gaige (USNM). *Jim Wells County.* Alice, 8 m. NE., 25, viii.25.35, C. E. Burt (USNM). *Llano County.* Near Llano, 5 ♂, 5 ♀, iv.25.63, G. Child (NMSU). *Pecos County.* Pecos R., Rt. 290, 3 ♂, 4 ♀, iv.23.63; Sheffield, 1 ♀, iv.23.63, G. Child (NMSU). *Presidio County.* Marfa, 14 m. N., 3 ♂, 8 ♀, viii.1.61, JRZ (NMSU). *Sutton County.* Devil's River (Nr. Sonora), 8, v.3-6.07, Pratt & Schwarz (USNM). *Travis County.* Austin, 4 ♂, 1 ♀, xii.5.28, J. O. Martin (CAS). *Uvalde County.* Sabinal, 1, iii.—.10, F. C. Pratt (USNM). *Val Verde County.* Del Rio, 5, vii.23-24.—, Wickham (USNM); 7 ♂, 13 ♀, xi.15.49, O. Bryant (CAS). *Webb County.* Laredo, 1 ♀, v.20-24.48, F. G. Wagner & W. Nutting (ARI). *Zapata County.* Zapata, 12, ii.26.36, J. G. Needham (CNL). **UTAH.** Ogden, 1 ♂ (Acc. 4858) (AMNH). *Washington County.* Hurricane, 1 ♀, vi.22.59, R. D. Anderson. New Harmony, 1 ♀, x.4.64; 28, x.11.64, R. D. Anderson (RDA). St. George, 2 ♂, xii.29.59, G. Musser (CAS). **WYOMING.** *Goshen County.* Ft. Laramie, 3.5 m. S., 2 ♂, viii.19.65, H. B. Leech (CAS).

MEXICO.—**AGUASCALIENTES.** Aguascalientes, 1 m. N., 4 ♂, 1 ♀, vii.26.62, JRZ (NMSU). **BAJA CALIFORNIA.** Agua Caliente (Cape district), 3 ♀, iv.22.47, I. La Rivers (BERK). Arroyo de Calamajue, Near Calamajue, 1 ♂, 1 ♀, iv.9.61, A. G. Smith (CAS). Cabo San Lucas, 7.7 m. NE., 1 ♂, 4 ♀, i.1.59, H. B. Leech (CAS). Catarina, 3, ix.2.51, G. A. Marsh; El Carrizal, 8 ♂, 7 ♀, iv.25.47, I. La Rivers (BERK). El Triunfo, 2 ♂, i.9.59; La Paz, 8.2 m. W. Hwy. Sur 1, 2 ♀, xii.31.58; 4 ♂, 5 ♀, xii.31.58; 9.6 m. E., 1 ♂, 1 ♀, xii.30.58; 12.4 m. E., Las Cruces Road, 2 ♂, 6 ♀, xii.23.58, H. B. Leech; 4 ♀, x.10.55, F. X. Williams; La Suerte, 1 ♂, 1 ♀, vi.4.63, R. K. Benjamin (CAS). La Zapopita, Valle de Trinidad, 1 ♂, iv.10.61, F. S. Truxal (LACM). Las Paras, 1, W. W. Mann (USNM). Miraflores, 3 m. NW., 1 ♂, H. B. Leech (CAS). Padarone, Amarillo Arroyo, 12 ♂, 20 ♀, v.11.47, I. La Rivers (BERK). San Antonio, 1 ♂, vii.12-17.19 (CAS). San Bartolo, 1 m. SE., 1 ♀, i.20.59, H. B. Leech; 3 ♀, v.1.47, I. La Rivers (CAS). San Felipe, 2, J. D. Sherman, Jr. (USNM). San Jose del Cabo, 4, Wickham (USNM). San Luis Gonzaga, 12 m. E., 45 ♂, 45 ♀, v.22.47, I. La Rivers (BERK). Todos Santos, 1 ♀, iv.10.47, I. La Rivers; 9 m. S., 1 ♂, 2 ♀, i.14.59, H. B. Leech (CAS). **CHIHUAHUA.** Camargo, 1 m. N., 15 ♂, 3 ♀, vii.25.62; Casas Grandes, 5 m. E., 27 ♂, 26 ♀, xii.20.64, JRZ (NMSU). Catarinas, 5800 feet, 1 ♀, vii.25.47, M. Cazier (AMNH). Chihuahua, 43 m. N., 143 ♂, 167 ♀, xii.8.62; Colonia Juarez, 2 m. SW., 1 ♀, xii.20.64; Parral, 2 m. S., 1 ♀, vii.25.62; 10 m. S., 1 ♀, xii.9.62, JRZ (NMSU). Primavera, 3 ♂, vi.30.47, M. Cazier, W. Gertsch, R. Schrammel (AMNH). **COAHUILA.** Ramos Arizpe, 4 ♂, 4 ♀, vii.7.63, JRZ (NMSU). Villa Acuna, S. Lorenzo Rnch., 2 ♂, 3 ♀, vi.16.38, R. H. Baker (TAM). **COLIMA.** Trapechi (near Colima), 1 ♂, 4 ♀, vii.30.62, JRZ

(NMSU). **DURANGO.** Abasolo, Rio Nazas, 3 ♂, 3 ♀, vii.25.62; 58 ♂, 61 ♀, x.22.66, A. H. Smith & JRZ; Durango, 1 ♂, vii.26.62; 20 m. W., 1 ♂, xii.10.62; San Juan del Rio, 10 m. N., 2 ♂, 4 ♀, xii.9.62, JRZ (NMSU). **GUANAJUATO.** Guanajuato, 2 ♂, 3 ♀, vi.20.57, D. R. Lauck (USNM). Irapuato, 5 m. S., 10 ♂, 4 ♀; Leon, 5 m. S., 1 ♀, vii.26.62, JRZ (NMSU). **HIDALGO.** Zimapan, 4 ♂, 2 ♀, vii.9.63, JRZ (NMSU). **JALISCO.** Ameca, 25 km. E., 1 ♂, iii.25.64, JRZ (NMSU). Barranca Oblato, 1 ♀, x.23.66, A. H. Smith & JRZ (NMSU). Cd. Guzman, 5 m. N., 2 ♂, 1 ♀, ii.30.62, JRZ (NMSU). Guadalajara, 8 m. S., 1 ♂, 2 ♀, ix.—.54, F. X. Williams (CAS); 11 m. S., 5 ♂, 3 ♀, vii.30.62; 20 m. E., 1 ♂, 1 ♀, JRZ (NMSU). Jilquilpan, 20 m. W., 1 ♂, 5 ♀, xi.30.48, H. B. Leech, E. S. Ross (CAS). Lagos de Moreno, 2 ♂, 4 ♀, vii.26.62, JRZ (NMSU). Mazamitla, 1 m. NW., 1 ♂, 1 ♀, ii.8.53, I. J. Cantral (UMMZ); 5 km. E., 1 ♂, 1 ♀, iii.27.64; Near Tala, 1 ♂, 2 ♀, iii.25.64; Near Tizapan, Rd. 15, 13 ♂, 9 ♀, iii.26.64, JRZ (NMSU). Ojuelos de Jalisco, 12 m. S., 2 ♂, 3 ♀, xi.21.48, H. B. Leech (CAS). South of Guadalajara, 3 ♀, viii.11.57, D. Lauck (USNM). Tecolotlan, 3 ♂, 4 ♀, x.24.66, JRZ (NMSU). Tehetlican, Rd. 110, 1 ♂, 1 ♀, vii.28.62, JRZ (NMSU). Tlaquepaque, 1 ♀, vii.—.53, N. L. H. Kraus (CAS). Union de Tula, 10 m. S., 2 ♂, 7 ♀, iii.28.64; Zapotlenejo, 7 m. E., 4 ♂, 1 ♀, iii.25.64, JRZ (NMSU). **MICHOACAN.** Cuitzeo (near), 4 ♀, vii.27.62, JRZ (NMSU). Jacona, 3 ♀, viii.11.57, D. R. Lauck (USNM). Jiquilpan, 8 km. E., 3 ♂, 2 ♀, JRZ (NMSU). Zamora, 9 m. W., 1 ♂, xii.6.48, H. B. Leech (CAS); 1 ♂, 1 ♀, vii.28.62, JRZ (NMSU). **NAYARIT.** San Blas, 5 m. E., 1 ♂, vii.31.62, JRZ (NMSU). **NUEVO LEON.** Arroyo de Lajillas, 10 m. S. Linares, 3 ♂, 3 ♀, xii.18.40, F. N. Young (UMMZ). Linares, 20 m. W., Rio Linares, 6 ♂, x.16.48, H. B. Leech (CAS). Santa Catarina, Huasteca Can., 5 ♂, 6 ♀, vii.7.63, JRZ (NMSU). **PUEBLA.** Near Maria Andrea, 1 ♀, ix.10.64, JRZ (NMSU). **QUERETARO.** Queretaro, 17 ♂, 7 ♀, iii.27.63, JRZ (NMSU); 3 ♀, vi.20.57, D. R. Lauck (NMSU). San Juan del Rio, 5 ♂, 1 ♀, iii.27.63, JRZ (NMSU). **SAN LUIS POTOSI.** Agua Zarca (near Cd. del Maiz), Rd. 80, 3 ♂, 1 ♀, iii.25.63; El Salto, 1 ♀, iii.25.63; Guaymuchil (near Naranjo), 1 ♂, iii.25.63; Jitalpa, 1 ♀, iii.23.63; Presa de Guadalupe, Rt. 80, 5 ♂, 1 ♀, iii.26.63, JRZ (NMSU); Cuidad del Maiz, 5 ♂, 3 ♀, xi.20.48, H. B. Leech (CAS). Santa Maria del Rio, 4 ♂, 3 ♀, iii.26.63, JRZ (NMSU). **SONORA.** Aribabi (E. of Moctezuma), 4 ♂, 2 ♀, xii.15.62; Bavispe, 1 ♂, 2 ♀, vii.26.63, JRZ (NMSU). Etchojoa, 7 m. NE., 4 ♂, 10 ♀, i.27.51, A. A. Hubert (CAS). Hermosillo, 1 ♀, ix.19-20.52, B. Malkin & U. Thatcher (FM); 50 km. W., 2 ♂, viii.21.53; 1 ♀, vii.9-16.53, B. Malkin (FM). **ZACATECAS.** Fresnillo, 16 m. NW., Rio Trujillo, 1 ♂, vi.29.54, R. N. Brewer; Pinos, 10 m. S., 8 ♂, 5 ♀, viii.1.59, 15 m. S., 1 ♂, viii.2.59, Ray Bandar (CAS).

Intergradation in Laccophilus fasciatus

There are three zones of intergradation in *Laccophilus fasciatus*. One is between *L. f. rufus* and *L. f. terminalis*, and two are between

L. f. fasciatus and *L. f. terminalis.* Intergrades between *rufus* and *terminalis* occur in a band that extends from central Texas to east central Kansas at about the ninety-seventh parallel. Several hundred specimens have been collected from several dozen localities in a strip about 150 miles long that reaches from Dickenson County, Kansas, to Noble County, Oklahoma (Tasch and Zimmerman 1961). In that zone most of the specimens were more like *rufus* than *terminalis* in elytral pattern and genitalia. Some intermediates were almost always present in any sample, however; and on a few occasions in Harper, Kingman, and Sedgwick Counties, Kansas, the samples were almost entirely of the *terminalis* pattern and genitalia. The overlap in size and body proportions is great enough that it is not possible to recognize clearly an intermediate condition in length or in the ratio of pronotal width divided by length (Table 2). The mean values are, perhaps, closer to the bulk of *rufus* size means than to those of *terminalis.* Two large samples from Texas verify that the zone does continue southward below Oklahoma. In Texas there are also a sufficient number of samples to illustrate clearly that the zone is a narrow one that is probably less than 50 to 100 miles wide at the most.

Intergrades were not recognized soon enough in Kansas and Oklahoma to find how far westward the zone extends. In the western parts of those states, there is no evidence of intergradation. The limits of the range of both races occur in South Dakota where they are entirely allopatric (Zimmerman and Severin 1957). *L. f. rufus* is confined to the extreme southeastern corner of the state and *terminalis* to the southwestern one.

The situation between *terminalis* and *fasciatus* is more complex. Intergrades occur in a long narrow strip from Pima county, Arizona, along the west coast of Mexico to Nayarit and, perhaps, into Jalisco. In Arizona most *terminalis* populations occur without any evidence of intergradation with *fasciatus,* but the few specimens of *fasciatus* that have been taken and previously identified as *apicalis* (its synonym) show evidence of *terminalis* influence when closely examined. Farther south along the coast, the general hybridizing of the two races is more apparent in elytral pattern, genitalia, size, body proportions, and larger average size of the males over females (Table 2).

In Jalisco there is evidence that the two races occur with no intergradation. Not one intergrade has been found in more than 250 specimens from that state. In the usually diagnostic features of elytral

pattern, male genitalia, size, and body proportion, the populations segregate into two distinct groups with no intermediates. One slight bit of evidence for intergradation, however, is that a very large number of *fasciatus* from the vicinity of Autlan (74 males and 92 females) have slightly larger mean values for length. The males are 4.80 mm and the females are 4.74 mm which approaches the values for *terminalis* populations. Usually the values are about 0.05 mm shorter in both cases for *fasciatus*.

On the east coast of Mexico, there is also some slight evidence of intergradation. In south Texas *terminalis* shows no influence from *fasciatus* or *rufus*. A few (less than ten) specimens of *fasciatus* individuals with *terminalis* characters have been recognized, however. Conversely, in southern Tamaulipas and northeastern tropical San Luis Potosi, *fasciatus* generally occurs without evidence of *terminalis* admixture; but occasional populations with intergrades do occur.

In all three instances, intergradation is clearly restricted to what could be considered to be intermediate ecological areas in which intergrades might be as well adapted as parental genotypes. Between *rufus* and *terminalis* the zone is in the ecotonal region between a humid region and an arid one. In both instances of intergradation between *fasciatus* and *terminalis,* the intergrades are between an arid temperate climate and a humid tropical one.

The range of *fasciatus* approaches *rufus* in Texas, but as yet there is no evidence of any contact between the two races. In some ways these two races show more affinity than either does with *terminalis*. They are more similar in elytral patterns, size, male genitalia, and ecological preferences. It is possible that originally these two were continuous while separated from *terminalis*; but, with the generally increasing aridity of the Southwest and Mexican Plateau, *terminalis* has increased its range more rapidly and has interposed between them so that it now serves as the link between the races.

MATERIAL EXAMINED

L. f. fasciatus × *L. f. terminalis*

UNITED STATES OF AMERICA. — **ARIZONA.** Catalina Mtns., 2, xi.8.33, Kath. Thomas (ARI); Bear Canyon, 3 ♂, 2 ♀, iii.26.46, J. W. Green (CAS). Santa Rita Mtns., Florida Canyon, 1 ♂, 1 ♀, xii.2.61, JRZ (NMSU). Tucson, 1 ♂, ix.—.28, F. H. Parker (CAS). *Santa Cruz County.* Nogales, 1 ♂,

iv.—.97 (CAS). **CALIFORNIA.** *Riverside County.* Riverside, 1 ♂, F. E. Winters (CAS). **TEXAS.** *Kleberg County.* Riviera, 1 ♀, ii.28.36, J. G. Needham (CNL). Not located. Eyle, 1 ♀, vi.15.57, David Lauck (USNM).

MEXICO. — **NAYARIT.** Acaponeta, 8 m. NW., Rio de las Canyas, 1 ♂, 1 ♀, xii.25.58, H. B. Leech (CAS). San Blas, 7 ♂, 11 ♀, ix.17-20.53, B. Malkin (CAS); 1 ♀, ix.28.61, C. O. Morse (CAS); 5 m. E., 10 ♂, 8 ♀, viii.31.62, JRZ (NMSU). Sierra de Zapotan, 1 ♂, 3 ♀, xi.—.42, Eugenio Paredes; Tepec, 18 m. NW., 4 ♀, xi.27.48; 20.5 m. NW., 1 ♂, xi.24.48, H. B. Leech (CAS). **SAN LUIS POTOSI.** Agua Zarca (near Platanito), 4 ♂, 2 ♀, iii.25.63; Comoca, Rio Axtla, iii.23.63, JRZ (NMSU). C. del Maiz, 1 ♂, 1 ♀, xi.19.48, H. B. Leech (CAS). Guaymuchil (near Naranjo), 1 ♂, 2 ♀, iii.25.63; El Salto, 3 ♂, 10 ♀, iii.25.63, JRZ (NMSU). Jitalpa, 1 ♀, iii.23.63, JRZ (NMSU). Palitla, 5 m. N. Tamazunchale, 4 ♂, 2 ♀, xii.22.48, H. B. Leech (CAS). Tamazunchale, 1 ♂, xii.30.47, Mulaik (CAS). Valles, 29 m. N., 1 ♂, viii.19.54, F. N. Young (UMMZ). **SINALOA.** Concordia, 8 m. E., 1 ♂, 1 ♀, xii.12.62; Culiacan, 10 m. N., 1 ♂, 8 ♀, viii.1.62, JRZ (NMSU). Elota, 6 ♂, 4 ♀, vi.27.56, R. & K. Dreisbach (MCHS); 1 m. S., 7 ♂, 7 ♀, viii.1.62, JRZ (NMSU). Guasave, 4 ♂, 2 ♀, i.25.51, A. A. Hubert (CAS). Los Mochis, 6 ♂, 6 ♀, vi.13.22, C. T. Dodds (CAS). Mazatlan, 7 ♂, 7 ♀, viii.1.62; 27 ♂, 29 ♀, xii.11.62; 7 m. S., 9 ♂, 13 ♀, xii.11.62, JRZ (NMSU). Wolamo, 1 ♂, vi.27.56, R. & K. Dreisbach (MCHS). (Villa) Union, 1 ♂, 1 ♀, vi.28.56, R. & K. Dreisbach (MCHS). **SONORA.** Alamos, 1 ♀, ii.23.63, P. H. Arnaud, Jr. (CAS); 7 m. SE., 1 ♀, viii.12.60, P. H. Arnaud, E. S. Ross, D. C. Rentz (CAS). Guaymas, 3, ix.29.23, W. M. Mann (USNM); 1 ♂, ix.9.23, W. M. Mann (CAS). Hermosillo, 50 km. W., Rancho San Francisco, 3 ♂, viii.21.53, B. Malkin (CAS). Puerto Kino, 25 m. E., Rancho Montijo, 1 ♀, vii.23.50, J. P. Figg-Hoblyn (CAS). **TAMAULIPAS.** Antiguo Morelos, 1 ♀, iii.23.63; 3 m. N., 1 ♂, 2 ♀, iii.26.63; Near El Limon, 1 ♂, iii.24.63; Llera, Rio Guayalejo, 2 ♂, 8 ♀, iii.23.63; 20 m. S., 2 ♀, iii.24.63; Nuevo Morelos, 1 ♂, iii.25.63; Ocampo, 2 ♂, iii.24.63, JRZ (NMSU).

L. f. rufus × *L. f. terminalis*

UNITED STATES OF AMERICA. — **KANSAS.** *Barber County.* Isabel, 2, iv.14.52, D. R. Bell (USNM). *Dickenson County.* Mt. Hope, 4 m. S., 7 ♂, 9 ♀, vii.8.60; 2 m. N., 3 ♂, 2 ♀, vii.15.60; Nr. Elmo, 11 ♂, 9 ♀, vii.15.60; 2 ♂, vi.11.58, JRZ (NMSU). *Doniphan County.* Wathena, 2 ♂, 1 ♀, C. T. Brues (MCZ). *Harper County.* NE. corner of County, 7 ♂, 3 ♀, vii.20.60; Danville, 2 m. S., 27 ♂, 14 ♀, vii.20.60, JRZ (NMSU). *Harvey County.* Newton, 3 m. S., 1 ♂, vi.21.58; 2 m. SE., 1 ♂, 1 ♀, vi.21.58; 7 m. S., 3 ♂, 2 ♀, viii.12.59; 4 m. SE., 1 ♂, 10 ♀, viii.12.59; 3 m. E., 12 ♂, 5 ♀, vii.6.60; 2 m. E., 1 ♂, 3 ♀, vii.7.60; 4 ♂, 1 ♀, vii.6.60, JRZ (NMSU). Sedgwick, 5 ♂, 6 ♀, vii.13.60; Walton, 5 m. S., 1 ♀, viii.14.59, JRZ (NMSU). *Kingman County.* Murdock, 2 m. S., 4 ♂, 3 ♀, vii.14.60; Waterloo, 5 m. E., 5 ♂, 2 ♀, vii.14.60, JRZ (NMSU). *Marion County.* Hillsboro, 4 m. NE., 1 ♀, viii.9.60; 6 m. NE., 1 ♂, viii.9.60; Nr. Marion, 5 ♂, 7 ♀, viii.20.59; 2.5 m. NW., 1 ♂, viii.9.60, JRZ (NMSU). *Reno County.* Haven, 8 m. E., 7 ♂, 7 ♀, vii.13.60;

2 ♂, 7 ♀, vii.19.60; 4 m. S., 4 ♂, 5 ♀, vii.19.60, JRZ (NMSU). *Sedgwick County*. Cheney, 2 ♀, vi.5.58; Derby, 23 ♂, 28 ♀, vi.10.58; Kechi, 7 ♂, 10 ♀, viii.10.59; Near Viola, 67 ♂, 42 ♀, viii.10.60; Near Bentley, 2 ♂, 4 ♀, iv.11.58; St. Mary's, 1 m. S., 5 ♂, vii.13.60; Wichita, 3 m. E., 37 ♂, 35 ♀, ix.28.57; 7 ♂, 7 ♀, iii.31.58; 5 ♀, iv.26.58; 3 ♂, 4 ♀, v.12.58; Wichita, 8 ♂, 2 ♀, vi.9.58, JRZ (NMSU). *Sumner County*. Hunnewell, 14 ♂, 14 ♀, vi.22.60; 5 m. S., 1 ♂, 1 ♀, vi.22.60; South Haven, 4 m. N., 1 ♂, vi.23.60; 3 ♀, vi.21.60, JRZ (NMSU). **OKLAHOMA.** *Kay County*. Blackwell, 2 m. NW., 11 ♂, 10 ♀, vi.20.60; 3 m. SW., 2 ♂, 3 ♀, vi.30.60; 3 m. E., 1 ♀, vi.30.60; Braman, 2 ♂, 4 ♀, vi.20.60; 8 m. E., 2 ♀, vi.20.60; 4 m. W., 1 ♀, vi.27.60; 2.5 m. NW., 9 ♂, 6 ♀, vi.28.60; 1.5 m. SW., 1 ♂, vi.28.60; Tonkawa, 1 m. S., 1 ♂, vi.23.60; 4 m. NW., 18 ♂, 7 ♀, vi.30.60, JRZ (NMSU). *Noble County*. Near Ceres, 3 ♂, 4 ♀, vi.23.60; Perry, 3 m. N., 8 ♂, 9 ♀, vii.1.60; 4 m. E., 7 ♂, 18 ♀, viii.1.60, JRZ (NMSU). **TEXAS.** *Dallas County*. Dallas, 2 ♂, Wickham (AMNH); 1 ♂, Leng, Van Dyke (CAS); 3, v.16.11, H. Pinkus; 1, Wickham (USNM); 1 ♂, 1 ♀, Boll (MCHS); 1 ♂, 1 ♀, Boll (NMSU); 11 ♂, 19 ♀, Boll (MCZ). *Lee County*. 1 (CNL); 6, J. D. Sherman, Jr. (USNM); 5 (USNM); Fedor, 1 ♂, v.26.09; 1 ♂, 1 ♀, vi.—.— (MCZ).

Laccophilus proximus Say (Figs. 54-61, 289)

Laccophilus proximus Say, 1823, p. 101 (taken from J. L. LeConte's editing of the complete writings of Thomas Say, 1891, p. 514). *Neotype*: male, Beaufort, Beaufort County, South Carolina, AMNH; Crotch, 1873, p. 400; Schwarz, 1878, p. 438; Sharp, 1882a, p. 289; Blatchley, 1910, p. 210; Blatchley, 1919, p. 308; Leng, 1920, p. 77; Zimmermann, 1920, p. 25; Wilson, 1923b, p. 290; Young, 1953a, p. 34; Young, 1953b, Young, 1954, p. 45; Zimmerman and Severin, 1957, p. 31; Zimmerman, 1960, p. 143.

Laccophilus americanus Aubé, 1838, p. 422; Sharp, 1882a, p. 291; Sharp, 1882b, p. 11.

Laccophilus confusus Sharp, 1882a, p. 292; Sharp, 1882b, p. 11.

DIAGNOSIS. — Recognition of this species is sometimes difficult without examination of male genitalia. It belongs to the irrorated group with a coxal file and sawlike ovipositor. It differs from *L. maculosus* in its small size (under 4.5 mm as compared to usually over 5.0 mm). It has less darkening and coalescence of dots on the elytra than does *L. m. maculosus* or *L. fasciatus*; and it is brown, yellow-brown or reddish-brown beneath unlike *L. mexicanus* or *L. salvini*. Superficially its elytral pattern is similar to *L. fuscipennis, L. vacaensis,* and *L. spangleri,* but differs as seen in figures 289, 290, 312-314. The metacoxal file is weak in *fuscipennis* males; and there is usually an epipleural flange in females of *fuscipennis,* but rarely in *proximus*. *L. vacaensis* and *L. spangleri* lack a file and have rakelike ovipositors.

DESCRIPTION. — Small to medium (length 3.8 to 4.6 mm; width 2.1 to 2.4 mm), brown, irrorated species; metacoxal file prominent in males and weakly present in females; prosternal process short; ovipositor sawlike. COLOR.

Head: yellow above and beneath with strong reddish-brown tinge between the eyes in the occipital region; appendages pale yellow except mandibles which darken to brownish-red toward tip. *Pronotum*: about the same color as head, but tending toward paler yellow at sides. *Elytra*: pale brownish-yellow background with irroration forming a pattern as shown in figure 289; coalescence of pigment slight and rarely in specimens from north of Florida in the United States, with no intensification of pigment at pattern margin as in *maculosus*; epipleura pale yellow anteriorly, darkening to brownish-red in posterior constricted portion. *Tergite VIII*: pale yellow or pale brown in the distal half, varying from nearly black to pale brown in proximal half. *Venter* and *genitalia*: varying from brownish-yellow to brownish-red, seldom dark reddish-brown as in *maculosus*. ANATOMY. *Microreticulation*: weakly double on head, pronotum, and elytra; secondary mesh discernible, but individual cellules still apparent. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: WH/PW, 0.71; LP/PW, 0.40. *Elytra*: epipleura rarely with flange in United States populations, but common in Mexico and West Indian specimens; apices slightly truncate. *Venter*: coxal file prominent in males and composed of 24 to 28 lines; much weaker in female and composed of about 10 lines; prosternal process with well-defined crest; lobes of postcoxal processes rounded and laterally projecting well posterior to midline; small protuberance on the middle of the left posterior margin of the male fifth abdominal segment; hind margin of male and female last ventral segment scarcely or not at all produced; small asymmetrical crest on male segment, but smoothly rounded in female. *Legs*: male pro- and mesotarsi enlarged in dorsoventral plane; palettes easily distinguished at 20 power magnification; fifth tarsal segment of proleg twice as long as fourth, and fifth segment of middle leg one and two-thirds as long as fourth; profemoral setae (6 to 7) shorter and finer than mesofemoral ones (5 to 6). *Genitalia*: oval plate produced to acuminate tip with prominent ventral crest curving strongly to the right; 8 to 10 raised lines on the right of the crest and 3 to 4 on the left; left paramere with an asymmetrical apex; right paramere with produced apex; aedeagus evenly curved and tapered to apex; ovipositor with about 13 sawlike teeth on each valve.

NOMENCLATURAL NOTES. — Young (1954) expressed the opinion that *proximus* represents a number of allopatric subspecies. Since *americanus* Aubé was described from the West Indies, it is clearly allopatric to mainland populations, and it does appear to be different. It is not clear what the nature of the variation is and how the different populations are distributed throughout the Caribbean, however, so no subspecific status for *americanus* is presented in this paper. All mainland populations appear sufficiently similar to retain in a single race, including Sharp's *confusus* from Tabasco, Mexico. Sharp thought that *proximus* was the same as *maculosus*, but these are clearly two different broadly sympatric species.

Table 3. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus proximus*.

Locality	N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
Dade Co., Florida	26	4.17 0.154	3.27 0.135	....	2.30 0.082	1.81 0.075	0.553	0.0035
Duval Co., Florida	62	4.33 0.151	3.38 0.137	....	2.39 0.088	1.87 0.071	0.554	0.0026
Beaufort Co., South Carolina	89	4.30 0.166	3.38 0.137	....	2.39 0.106	1.88 0.077	0.555	0.0010
New York, New York	33	4.33 0.171	3.38 0.145	....	2.39 0.101	1.89 0.076	0.560	0.0059
Monroe Co., Indiana	130	4.29 0.160	3.40 0.131	....	2.35 0.102	1.87 0.072	0.548	0.0014
Douglas Co., Kansas	52	4.19 0.133	3.39 0.111	....	2.33 0.087	1.84 0.051	0.552	0.0029
Sedgwick Co., Kansas	105	4.28 0.175	3.38 0.146	....	2.35 0.108	1.86 0.079	0.551	0.0018
Lincoln Co., Nebraska	31	4.33 0.165	3.42 0.121	(22)	2.36 0.083	1.89 0.059	0.551	0.0035
St. Landry Co., Louisiana	63	4.24 0.173	3.30 0.124	....	2.33 0.095	1.86 0.069	0.565	0.0024
Grayson Co., Texas	39	4.27 0.132	3.38 0.103	(27)	2.37 0.078	1.89 0.055	0.559	0.0033
Brazos Co., Texas	91	4.20 0.151	3.37 0.134	....	2.30 0.091	1.86 0.070	0.553	0.0020
Cameron Co., Texas	20	4.16 0.172	3.31 0.150	....	2.28 0.102	1.82 0.071	0.549	0.0056
Trans-Pecos, Texas	23	4.18 0.143	3.30 0.119	....	2.31 0.100	1.83 0.070	0.557	0.0045
Campeche	72	4.22 0.126	3.37 0.111	(58)	2.34 0.080	1.87 0.059	0.555	0.0019
Yucatan	19	4.24 0.139	3.44 0.116	....	2.32 0.076	1.86 0.073	0.558	0.0105

VARIATION. — Elytral pattern is remarkably uniform in continental *proximus.* Specimens from southern Mexico, Kansas, and Florida appear to be drawn from the same sample. Color differs in specimens from southern Florida and from some of the western states, however. Young (1954) says that *proximus* from southern Florida are brighter than those to the north. Very pale individuals appear in the populations as one moves across the plains states, but the percentage is never very high. Males and females show no difference in size or shape and have been combined in Table 3.

Neither morphology nor quantitative data support retaining *confusus* as a separate subspecies. It was described by Sharp from Villahermosa, Tabasco, but samples from nearby states in southern Mexico yield the same values as those from the United States. In fact, there is greater variation among northern localities than between Mexico and the United States. South Texas (Cameron Co.), Trans-Pecos, Texas and Florida have mean values considerably lower than other localities. They may represent real geographic differences; but, unfortunately, sample size is comparatively small for all three and one hesitates before concluding that these are different. Young had felt that southern Florida populations were smaller than those from northern Florida, however. Also, it would not be surprising if populations on the edge of the range such as the Trans-Pecos one did differ from the rest of the species.

There are anomalous values for the WP/EL ratio (Monroe Co., Indiana, St. Landry Co., Louisiana) which I am inclined to believe are due to incorrect measurement of the elytral length. Other nearby samples and other measurements do not support any real differences in the populations; thus measuring errors for these two samples can be suspected. The WP/EL ratio is about 0.555 for *proximus*, if the two samples in question are not included.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This is one of the most widespread species in North America. Even though it has a very large range, there appears to be little evidence of racial differentiation on the continent. In the West Indies there does seem to be a different race, however. The definition of its range is beyond scope of this study, and only locality records for the West Indies are included. *L. proximus* occurs from southeastern Canada to Florida, westward to eastern Wyoming, Colorado, northeastern

New Mexico, all of Texas, and southward in eastern coastal Mexico and Yucatan. It reaches across the Isthmus of Tehuantepec and may be sympatric with the related species, *L. salvini*. It is probably the most common *Laccophilus* in the southeastern United States. Its distribution in the northern tier of the United States is in scattered, widely separated localities that probably represent true distribution and not collecting gaps. As yet, it has not been found in northern Veracruz; but additional collecting should produce enough localities to show that the southern Mexican population is continuous with those in northern Mexico and Texas (Fig. 7).

Young (1954) describes *proximus* as one of the principal pioneer species of newly formed ponds, puddles, and other bodies of fresh water. He has taken adults in rain barrels, tin cans partly filled with water, flooded furrows in recently plowed fields, and even in water in old automobile tires in vacant lots. Throughout the Florida peninsula, it is the most common *Laccophilus* of temporary pools and puddles. It may appear in large numbers in recently filled, formerly dry basins. Zimmerman (1960) in Indiana found that *proximus* appeared but sporadically in four continuously observed ponds and did not occur during several months of the year. It was the first of four *Laccophilus* species to reappear in ponds that had previously dried up.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ALABAMA.** *Mobile County.* Chickasaw, 1, vi.25.31, H. Dietrich (CNL). Mobile, 1, viii.10.—, Shoemaker (USNM). **ARKANSAS.** *Garland County.* Hot Springs, 5 m. S., 3 ♂, 2 ♀, x.17.56, JRZ (NMSU). *Hempstead County.* Hope, 6, iii.20-27.22, E. W. Mank (CNL); 1 ♂, vi.20.32, L. Knoble (CAS); 1 m. N., 1 ♂, 1 ♀, x.17.56, JRZ (NMSU). *Hot Springs County.* County, 3 ♂, 3 ♀, x.17.56, JRZ (NMSU). *Monroe County.* Brinkley, 4 ♂, 6 ♀, vi.24.48, C. & P. Vaurie (AMNH). *Pulaski County.* Little Rock, 2 ♀, Wickham (AMNH). **COLORADO.** *Sedgwick County.* Ovid, 4 ♂, 6 ♀, viii.17.61, JRZ (NMSU). **CONNECTICUT.** *Fairfield County.* 3 ♂, vii.4.—, C. H. Roberts (AMNH). **DISTRICT OF COLUMBIA.** *Washington.* Shaw Pond, 1, iv.14.26, H. S. Barber (USNM). Washington, 1, vii.21.—, J. D. Sherman, Jr. (USNM). **FLORIDA.** *Alachua County.* Alachua County, 5, i.6.23, Chamberlain (CNL); 2 ♀, ix.26.—; 1, x.2.14; 3 ♂, ix.28.14; 1 ♀, i.6.23 (AMNH). Hogtown, 3, x.24.37, F. N. Young (CNL); Hogtown Ck., 1 ♂, 1 ♀, x.24.37, F. N. Young (AMNH). *Bay County.* Springfield, 1 ♀, x.16.41, F. H. Young (AMNH). *Brevard County.* Titusville, 2 ♂, 1 ♀, xi.8.11 (AMNH). *Broward County.* Davis, 5,

vii.27.39; 2 ♂, 4 ♀, vii.27.39, F. H. Young (AMNH). *Charlotte County.* Punta Gorda, 5 ♂, 5 ♀, xi.16.11 (AMNH). *Collier County.* Naples, 2 ♂, 4 ♀, iii.30.47, J. W. Green (CAS). *Dade County.* Coral Gables, 1 ♂, iv.6.46, F. H. Chermock (CAS). Buck Key, 1, Brainard (USNM). Homestead, 5, iv.8.51, H. & A. Howden (USNM); 2 ♂, 3 ♀, vi.11.51; 4 ♀, v.11.51, O. Bryant (CAS). Miami, 1, i.21.34; 1, x.7.33; 2 ♀, viii.26.37, F. N. Young (AMNH). Miami Springs, 1 ♂, viii.2.62, B. Benesh (CAS). *De Soto County.* Arcadia, Bunker Branch, 4, iii.20.38; 13, iv.6.39, J. C. Bradley (CNL). *Duval County.* Jacksonville, 2, iv.21.—, G. M. Greene (USNM); 13, viii.—.02 (USNM); 69 (USNM); 2 ♂, 2 ♀, Van Dyke (CAS); 19 ♂, 30 ♀, vii.—.—; 3 ♂, 1 ♀, vii.—.02; 1 ♂, vii.4.—; 35 ♂, 39 ♀, viii.—.—, W. S. Genung (AMNH); 2 ♀, v.10.—; v.1.—, P. Laurent (ANSP). *Franklin County.* Dog Island, 1 ♀, iv.16.47, F. N. Young (AMNH). *Gulf County.* Deadpond, Rockbluff, 1, iv.3.27, M. D. Leonard (CNL). Wewahitchka, 8, iv.6.27, M. D. Leonard (CNL). *Hendry County.* Clewiston, 10, iv.6.44, J. G. Needham (CNL). *Hernando County.* Brooksville, 1 ♂, 3 ♀, i.20-30.40, Van Dyke (CAS). *Highlands County.* Lake Placid, 8, iv.7.45; 2, ii.11.49, J. G. Needham (CNL). Near Avon Park, 1 ♀, viii.22.61, T. Morris (SCH). *Hillsborough County.* Tampa, 4, iv.21-24.—, Hubbard & Schwarz (USNM); MacDill Field, 1 ♂, 1 ♀, vi.5-12.43, B. Malkin (FM). *Lee County.* Estero, 1, ii.10.44, J. G. Needham (CNL). Ft. Myers, 1 ♂, iii.30.12 (AMNH). *Leon County.* 1, vii.26.22, Chamberlain (CNL). *Martin County.* Stuart, 1 ♂, 2 ♀, vi.25.51, O. Bryant (CAS). *Okeechobee County.* Okeechobee, 5, iii.18.43, W. Proctor (CNL). Sebring, 1 ♂, 2 ♀, vii.20.42, C. Parsons (CAS). *Orange County.* Winter Park, 2, ii.7.28; 16, i.12.29, Gehring (CNL). *Palm Beach County.* Jupiter, 4, ii.23.43, W. Procter (CNL); 2 ♂, viii.11.43, W. Procter (AMNH). Lake Worth, 1 ♂, 4 ♀ (AMNH). Palm Beach, 3, iii.25.43, W. Procter (CNL); 1 ♂, 1 ♀, iv.13.23, R. Hopping (CAS). *Pinellas County.* Belleair, 1 ♂ (AMNH). Dunedin, 1, iv.3.23; 3, iv.2-4.23, E. W. Mank (CNL). *Polk County.* Lakeland, 3 ♂, xi.10.11 (AMNH). *Putnam County.* Crescent City, 6 (USNM). Palatka, 1, v.3-4.16, J. C. Bradley (CNL). *St. Johns County.* Hastings, 38, v.—.—; 38 (USNM); 1, viii.16.50, P. J. Spangler (USNM); 1 (CNL); 2 ♂, 2 ♀ (AMNH). St. Augustine, 1, C. W. Johnson (USNM). *Sarasota County.* Englewood, 1, xii.2.43; 1, iii.—.44, J. G. Needham (CNL). Sarasota, 13, viii.14.10, J. C. Bradley (CNL); 1, ii.7.45, J. G. Needham (CNL); 1 ♂, ix.14.10, Van Dyke (CAS). *Seminole County.* Sanford, 2; 2, vii.—.— (USNM); 1 ♂, 2 ♀, iv.—.— (AMNH). *Taylor County.* County, 6 ♂, 12 ♀, viii.—.—, W. S. Genung (AMNH). *Volusia County.* Enterprise, 1, v.24.—, Hubbard & Schwarz (USNM); 5 ♂, 3 ♀, v.17.—, J. W. Green (CAS). Ormond, 1 ♂ (AMNH). **GEORGIA.** *Baker County.* Elmodel, 1 ♂, 1 ♀, x.29.38, H. H. Hobbs & F. N. Young (AMNH). *Bullock County.* Statesboro, 1 ♀, viii.15.50, F. N. Young (AMNH). *Charlton County.* Okefenokee Swamp, Billy's Island, 2, vi.—.12, J. D. Sherman, Jr. (USNM); 23, vi.—12; 2, v.9.11 (CNL); 1 ♂, 1 ♀, Van Dyke (CAS); Mixon's Hammock, 2, vi.16.12; Tralers Hill, 1, vi.22.— (CNL). *Chattahoochee County.* Ft. Benning, 1 ♂, vi.11.43, D. E. Beck

(CAS). *Decatur County*. Bainbridge, 1, vii.15-27.09; 2 ♂, ix.17.—; x.19.10, J. C. Bradley (CAS). Spring Creek, 1, vii.16-29.12; 3, viii.26-28.13 (CNL). *Floyd County*. Cave Spring, 1, viii.30.09 (CNL). *Fulton County*. Ft. McPherson, 1 ♂, 1 ♀, ix.12.43, D. E. Beck (CAS). *Hill County*. Gainsville, 6, iv.2.11 (CNL); 1 ♂, iv.2.11, Van Dyke (CAS). *Jefferson County*. Wrens, 1, iii.8.11, J. D. Sherman, Jr. (USNM); 2, iii.8.11 (CNL). *Liberty County*. Riceboro, 2 ♂, 1 ♀, viii.16.50, F. N. Young (AMNH). *Lynn County*. St. Simon Island, 2; 1, ii.16.11; vi.12-22.11, J. C. Bradley (CNL). *Pierce County*. Blackshear, 6, v.10.11 (CNL). Offerman, 6, iv.22.11 (CNL). *Rabun County*. 7 ♂, 3 ♀, vii.—.—, C. W. Leng (CAS). *Thomas County*. Thomasville, 7, xii.22.34; D. Dunavan (USNM). **ILLINOIS.** *Alexander County*. Olive Branch, 2 ♀, x.8.09, Gerhard (FM). *Champaign County*. Urbana, 2, vii.29.07; 2, xi.19.—, J. D. Sherman, Jr. (USNM); 1 ♂, 1 ♀, xi.19.— (AMNH). *Cook County*. Edgebrook (Morton Grove), 13, vii.15.11 (USNM). *Pike County*. Pittsfield, 1 ♂, viii.17.46, B. Cadwell, 1 ♀, vii.7.46; 1 ♀, vii.8.46, A. T. McClay (DAV). **INDIANA.** *Clinton County*. Kirklin, 3 m. W., 5 ♂, 2 ♀, ix.26.58, JRZ (NMSU). *Huntington County*. Huntington, 2 m. N., 1 ♀, x.26.56, JRZ (NMSU). *La Porte County*. La Porte, 3 ♀ (CNG). *Madison County*. Anderson, 2 ♂, 2 ♀, vii.6.57, JRZ (NMSU). *Marion County*. Indianapolis, 1 ♂, viii.9.60, JRZ (NMSU). *Monroe County*. Bloomington, 2, xii.31.49, F. N. Young (CNL); 2 ♂, 2 ♀, xii.31.49, F. N. Young (AMNH); 4-5 m. N., 4 ♂, ix.15.55; 3 ♂, 6 ♀, ix.20.55; 6 ♂, 4 ♀, x.4.55; 1 ♂, iv.4.56; 2 ♂, 3 ♀, iv.20.56; 2 ♂, 4 ♀, iv.26.56; 1 ♂, v.11.56; 1 ♀, v.12.56; 2 ♂, 2 ♀, vii.21.56; 6 ♂, 14 ♀, viii.30.25; 15 ♂, 7 ♀, ix.17.56; 15 ♂, 6 ♀, ix.21.56; 7 ♂, 12 ♀, ix.28.56; 2 ♂, x.30.56; 1 ♂, x.31.56; 1 ♂, ii.22.57; 1 ♀, vi.18.57, JRZ (NMSU). *Owen County*. Richland Ck., near Freeman, 1 ♂, xi.2.55, JRZ (NMSU). *Porter County*. Dune Park (Ind. Dunes St. Pk.?), 1, J. D. Sherman, Jr. (USNM). *Posey County*. Mt. Vernon, 5 m. E., 3 ♂, ix.9.56, JRZ (NMSU). **IOWA.** *Hamilton County*. Little Wall L., 1 ♀, vi.14.52, P. J. Spangler (USNM). *Lee County*. Ft. Madison, 2, J. B. Smith (USNM). *Osceola County*. Sibley, 1, Shimek (USNM). *Polk County*. Herrold, 1, vii.24.19, E. D. Quisfeld (CNL). *Storey County*. Ames, 1 ♂, v.22.31, G. Hopping (CAS). *Warren County*. Indianola, 1 ♀, vi.14.52, P. J. Spangler (USNM). **KANSAS.** *Atchison County*. Atchison, 1 ♂, ix.23.56, J. W. McReynolds (CAS). *Cherokee County*. Galena, 5, viii.26.04; 15, J. D. Sherman, Jr. (USNM); 4, viii.26.04 (CNL); 15 (CNL). *Dickenson County*. Hope, 4 m. S., 4 ♂, 2 ♀, vii.8.60, JRZ (NMSU). *Douglas County*. Baldwin (City?), 2 ♂, 1 ♀, J. C. Bridwell (CAS). Lawrence, 12 ♂, 15 ♀, x.2.51, P. J. Spangler, Jr. (USNM); 1 ♂ (MCZ). Lone Star Lake, 2 ♂, 1 ♀, ix.30.51 (USNM). County, 1, iv.15.52, P. J. Spangler, Jr. (USNM); 2, F. H. Snow (CNL); 1 ♂, 3 ♀, x.7.48, J. G. Rozen (BERK). *Harper County*. Danville, 15 m. NE., 1 ♂, 3 ♀, vii.20.60, JRZ (NMSU). *Harvey County*. Newton, 2 m. SE., 5 ♂, 4 ♀, vii.21.58; 2 m. E., 4 ♂, 3 ♀, vii.6.60; JRZ (NMSU). *Johnson County*. Gardner Lake, 2 ♂, 3 ♀, v.3.52, Bell & Spangler; Sunflower, 1 ♀, ix.17.52, P. J. Spangler, Jr. (USNM). *Kingman County*. Waterloo, 5 m. E., 3 ♀,

vii.14.60, JRZ (NMSU). *Leavenworth County*. Tonganoxie, 1 ♀, vi.1.52; 3 ♂, 5 ♀, ix.4.52, P. J. Spangler, Jr. (USNM). *McPherson County*. McPherson, 2, J. D. Sherman, Jr. (USNM); 1 ♀, W. Knaus (AMNH). *Pottawatomie County*. Onaga, 5, J. D. Sherman, Jr. (USNM); 1 ♂ (AMNH). *Reno County*. Haven, 8 m. E., 4 ♂, 2 ♀, vii.13.60, JRZ (NMSU). Medora, 1 (USNM); 1 ♀, W. Knaus (AMNH). County, 4, ix.21.11, G. M. Greene (USNM). *Riley County*. 5, iv.9.—, Popenoe (USNM). *Sedgwick County*. Kechi, 5 ♂, 12 ♀, viii.10.59; near Viola, 3 ♂, 3 ♀, viii.10.60; Sunnydale, 5 m. E., 4 ♂, 1 ♀, vi.13.58; Wichita, 3 m. E., 41 ♂, 46 ♀, ix.28.57, JRZ (NMSU). *Seward County*. Liberal, 2 ♂, 4 ♀, viii.12.58; 3 m. NE. 1 ♂, 2 ♀, viii.12.58, JRZ (NMSU). *Shawnee County*. Topeka, 2, v.24.—; 1, vii.19.—; 1, vii.25.—; 3, Popenoe (USNM). *Sumner County*. Hunnewell, 5 m. S., 1 ♂, vi.22.60; South Haven, 4 m. N., 1 ♀, vi.23.60, JRZ (NMSU). **LOUISIANA.** *Acadia County*. Crowley, 1, ix.30.11, E. S. Tucker (USNM). Rayne, 3, vi.20.17 (CNL). *Cameron County*. Cameron, 2 ♀, vii.10-14.05, Van Dyke (CAS). *Lafayette County*. Lafayette, 1 ♂, v.19.51, O. Bryant (CAS). *Natchitoches County*. Vowell's Mill, 2, J. D. Sherman, Jr. (USNM); 4 ♂, 2 ♀, Leng (CAS); 4 ♂, 4 ♀, Leng (AMNH). *Orleans County*. New Orleans, Camp Planche, 3 ♀, ii.10.44, iii.10.44, D. E. Beck (CAS). *Plaquemines County*. Port Sulphur, 2 ♀, xi.6.43, D. E. Beck (CAS). *St. Landry County*. Opelousas, 3 ♂, 1 ♀, v.—.— (CNG); 4 m. W., 42 ♂, 64 ♀, vi.26.63, J. G. & K. C. Rozen (AMNH). *Vermilion County*. Gueydan, 33, vi.15-16.25; 46, vii.2.25; 1, vi.25.26, E. Klambach (USNM). *Vernon County*. Camp Polk, 1 ♂, vii.—.45, K. L. Maehler (CAS). *Baton Rouge County*. Baton Rouge, 1 ♀, vi.3.64, R. Hepburn (CAS). **MASSACHUSETTS.** *Middlesex County*. Lowell, 1 ♀, iv.20.71 (MCZ). **MARYLAND.** *Baltimore County*. Baltimore, 1 ♂, 1 ♀, vii.1.—; 1 ♀, vii.13.—, F. E. Blaisdell; 1 ♂, 1 ♀, vii.1.—; 1 ♀, vii.13.09, F. E. Blaisdell (CAS). *Montgomery County*. Piney Point, 4, viii.26.46, R. I. Sailer (USNM). **MICHIGAN.** *Berrien County*. Warren Dunes St. Pk., 1 ♂, 1 ♀, viii.19.52, P. J. Spangler, Jr. (USNM). *Emmet County*. Pellston, 4 m. N., 1 ♀, vi.25.52; 1 ♂, viii.6.52, P. J. Spangler, Jr. (USNM). *Macomb County*. Mt. Clemens, 1 ♂, vi.24.44, B. Malkin (FM). *Marquette County*. Marquette, 1, vii.2.16, J. D. Sherman, Jr. (USNM). *Van Buren County*. South Haven, 12, viii.2.—; 7, viii.11.04, J. D. Sherman, Jr. (USNM); 4 ♂, 5 ♀, viii.2.—, V. E. Shelford (AMNH). **MINNESOTA.** *Hennepin County*. Excelsior, 3, J. D. Sherman, Jr. (USNM). *Olmsted County*. Rochester, 17, vii.12.—; 16, J. D. Sherman, Jr. (USNM); 3 ♂, 1 ♀, vii.12.—, C. N. Ainslie (AMNH). County, 2, J. D. Sherman, Jr. (USNM). *Ramsey County*. St. Paul, 2, vii.—.—, J. D. Sherman, Jr. (USNM). **MISSISSIPPI.** *George County*. Lucedale, 1, vii.2.30; 1, vi.22.31, H. Dietrich (CNL). *Harrison County*. Biloxi, 10 m. N., 2 ♂, 3 ♀, viii.30.60, P. M. Marsh (DAV). *Jackson County*. Horn Island, 1 ♂, v.1.44; 1 ♂, vi.13.44; 1 ♂, 1 ♀, vi.16.44, E.A.R. (USNM). *Perry County*. Beaumont, 7, iv.19.32, H. Dietrich (CNL). **MISSOURI.** *Boone County*. Ashland, 4 ♂, 6 ♀, ix.9.54, P. J. Spangler (USNM). Columbia, 40 (USNM); 1, iii.29.36, W. M. Gordon (CNL); 1 ♂, x.8.54, P. J. Spangler

(USNM); 1 ♀, viii.12.46; 1 ♀, xii.8.46, W. R. Enns (CAS). Rocheport, 1 m. W., 1 ♂, 1 ♀, ix.25.54 (USNM). *Gentry County*. Albany, 2 ♂, 4 ♀, vi.13.52, P. J. Spangler (USNM); 3 ♂, 4 ♀, vi.13.52, P. J. Spangler (CAS). *Mississippi County*. Charleston, 1 m. N., 1, iv.23.56, P. J. Spangler (USNM). *Ripley County*. Doniphan, Logan Ck., 1, iv.23.56, P. J. Spangler (USNM). *St. Louis County*. Howard Bend, 4, vi.28.37; 17, vii.17.37, W. M. Gordon (CNL). St. Louis, 2 ♂, 2 ♀; 1 ♂, vi.—.— (CNG); 4, vii.—.77 (USNM). County, 3, ix.18.40, W. M. Gordon (CNL). *Shannon County*. Winona, 14 m. S., 1, iv.—.56, P. J. Spangler (USNM). *Vernon County*. Nevada, 1 ♂, v.11.58, J. W. McReynolds (CAS). **NEBRASKA.** *Arthur County*. Near Tyron, 7 ♂, 3 ♀, viii.17.61, JRZ (NMSU). *Keith County*. North of Ogalla, 1 ♂, 2 ♀, viii.17.61, JRZ (NMSU). *Lancaster County*. Lincoln, 1, Shimek (USNM). *Lincoln County*. North Platte, 1 m. S., 2 ♂, 2 ♀, viii.16.61; 1 m. E., 3 ♂, 5 ♀, viii.17.61; 10 m. W., 3 ♂, 5 ♀, viii.17.61, JRZ (NMSU). *Otoe County*. Palmyra, 1 ♀, W. F. Rapp, Jr. (WFR). *Saunders County*. Ceresco, 1, viii.25.59, W. F. Rapp, Jr. (CAS). **NEW HAMPSHIRE.** S(outhern?), 1 ♂, 1 ♀, x.16.06 (CAS). **NEW JERSEY.** *Bergen County*. Fort Lee, 1, ix.22.—, J. D. Sherman, Jr. (USNM). *Camden County*. Berlin, 1 ♀, vi.24.33, L. J. Bottimer (BERK). *May County*. Anglesea, 1 ♀ (AMNH); 3, G. M. Greene (USNM); 3, C. Boerner (CNL); 1 ♂, 2 ♀, v.10.—, J. W. Green (CAS); 4 ♂, 3 ♀, v.8.— (ANSP). *Ocean County*. Lakehurst, 6, ix.2.—; 1, ix.1.01; 8, J. D. Sherman, Jr. (USNM); 2 ♂, 1 ♀, iv.20.— (CAS). **NEW MEXICO.** *Colfax County*. Cimarron, 10 m. N., 1 ♀, vii.15.65, A. H. Smith; near Maxwell, 2 ♀, viii.14.61, JRZ (NMSU). *Harding County*. Mosquero, 10 m. E., 2 ♂, 4 ♀, x.23.65, A. H. Smith (NMSU). *San Miguel County*. Mosquero, 19 m. W., 1 ♂, 1 ♀, x.23.65; 2 m. W., 1 ♂, 1 ♀, x.23.65; Trujillo, 19 m. E., Trementina Ck., 2 ♀, x.23.65, A. H. Smith (NMSU). **NEW YORK.** *Nassau County*. Flushing, 2 ♂, viii.11.46, P. Vaurie (AMNH). *Niagara County*. Olcott, 3, viii.14.27, H. Dietrich (CNL). *Richmond County*. Staten Island, 2 (USNM); 3, J. D. Sherman, Jr. (USNM); 1 ♂, ix.27.38 (FM); 5 ♂, 1 ♀, ix.11.—, C. H. Roberts (AMNH). *Westchester County*. Peekskill, 2; 1, v.12.07, J. D. Sherman, Jr. (USNM). *Long Island*, 2 (USNM). **NORTH CAROLINA.** *Columbus County*, 1, vii.14-21.52 (USNM). *Pender County*. Willard, 1, v.11.53, W. M. Kulosh (USNM). *Swain County*. Bryson City, 8 m. SW., 3 ♀, v.18.57, JRZ (NMSU). **OHIO.** *Athens County*. Athens, 4 ♂, 5 ♀, v.21-22.51, P. J. Spangler (USNM). *Vinton County*. Lake Hope, 1 ♂, 1 ♀, vii.10.58, W. C. Stehr (CAS). *Warren County*. Mason, 2 m. S., 1 ♀, iv.24.57, JRZ (NMSU). **OKLAHOMA.** *Kay County*. Braman, 2.5 m. NW., 7 ♂, 7 ♀, vi.28.60; Tonkawa, 1 m. S., 2 ♂, 1 ♀, vi.23.60, JRZ (NMSU). *Noble County*. Perry, 4 m. E., 1 ♂, 3 ♀, viii.1.60, JRZ (NMSU). *Pittsburg County*. Savannah, 5 ♂, 5 ♀, x.19.56, JRZ (NMSU). *Seminole County*. Seminole, 5 m. NE., 1 ♂, 2 ♀, x.19.56, JRZ (NMSU). **PENNSYLVANIA.** *Allegheny County*. Aspinwall, 1 ♂, ix.18.28; Pittsburgh, 2 ♂, v.10.—; 1 ♂, 1 ♀, v.17.25 (CNG). *Butler County*. Evans City, Ash Stop, 1 ♂, vii.21.27 (CNG). *Dauphin County*. Linglestown, 1, Kaeber (USNM). *Elk County*. Caledonia, 4, J. D. Sherman,

Jr. (USNM). *Lancaster County*. Lancaster, 1, vii.14.—, Kaeber (USNM). *Philadelphia County*. Philadelphia, Phil. Neck, 2, J. D. Sherman, Jr. (USNM); 1 ♂, x.9.— (FM); 1 ♀, v.12.— (ANSP). **SOUTH CAROLINA.** *Beaufort County*. Beaufort, 3 ♂, 1 ♀, iii.23.92; 10 ♂, 13 ♀, iii.31.92; 2 ♂, 5 ♀, iv.7.92; 2 ♂, iv.11.92; 10 ♂, 23 ♀, iv.12.92; 4 ♀, iv.20.92; 5 ♂, 8 ♀, G. D. Bradford (AMNH). *Colleton County*. Ruffin, 1, viii.30.28, D. Dunavan (USNM). *Pickens County*. Clemson College, 2, xi.22.28; 1, 12.—.—, D. Donavan (USNM). **SOUTH DAKOTA.** *Brule County*. Chamberlain, 1 ♂, 1 ♀, ix.9.39, G. B. Spawn (AMNH). **TENNESSEE.** *Shelby County*. Memphis, 1 ♀, v.11.55, H. F. Howden (DAV). **TEXAS.** *Bastrop County*. Bastrop, 1 ♀, vii.12.37 (TAM); St. Pk., 1, vi.19.56, Evans & Matthews (CNL). *Bexar County*. Leon Ck., 2 ♀, x.11.52, B. J. Adelson (CAS). San Antonio, 1 ♂, 1 ♀, iv.9.58, J. F. Laurence (BERK); 1 ♀?, vi.—.42, E. S. Ross (CAS); 1 ♀, Wickham (CNG). *Blanco County*. Cypress Mill, 2, Chttn. (USNM); 1 ♂, ix.20.88; 3 ♂, 1 ♀, x.20.88 (CAS). Shovel Mtn., 12 (USNM); 1 ♂, 1 ♀ (CAS); 4 ♂, 4 ♀, ix.—.—, F. G. Schaupp (AMNH). *Bowie County*. Texarkana, 2 ♀, x.17.56, JRZ (NMSU). *Brazos County*. College Station, Wyxon L., 2 ♀, iv.18.53 (TAM); 5 ♂, 1 ♀, x.18.56, JRZ (NMSU); Fish Lake, 34 ♂, 48 ♀, x.17.64-i.24.65, Conte (TAM). *Brewster County*. Marathon, 2 ♂, 2 ♀, x.12.49, O. Bryant (CAS). *Burnett County*. 7, Hubbard & Schwarz (USNM); 2, J. D. Sherman, Jr. (USNM). County, 1 ♂, 1 ♀ (AMNH). *Calhoun County*. Port La Vaca, 1 ♂, 1954, P. A. Glick (CAS). *Cameron County*. Brownsville, 2, v.3.04, H. S. Barber (USNM); 1 (USNM); 1, vii.—.—, Wickham (USNM); 1 ♂ (FM); 1, vi.—.—, Dretz (USNM); 5 (USNM); 1 ♂, 1 ♀, vi.—.—, F. H. Snow; 2 ♀, x.—.42; 3 ♂, 1 ♀, xi.27.42; 1 ♂, vii.24.42, E. S. Ross (CAS); 1 ♂, 1 ♀, ix.22.24, Weed & Pray (FM); 1 ♂, iv.26.56, P. A. Glick; 4 ♀, x.4.57, W. Miller (SCH); Esperanza Ranch, 5, viii.19.— (USNM); Old Ft. Brown, 1, viii.3.06, A. B. Wolcott (USNM). Seabrook, 1 ♂, x.20.49, O. Bryant (CAS). *Colorado County*. Borden, 1, vi.18.—, Hubbard & Schwarz (USNM). Columbus, 5, vi.18.—; viii.1.—; v.4.—; vii.24.—; vi.27.—, C. V. Riley; 2, viii.1-6.—, Hubbard & Schwarz (USNM). *Comal County*. San Marcos, 13 m. W., 1 ♂, vi.24-25.61, R. L. Westcott (LACM). *Dallas County*. Dallas, 1, v.22.05, I. C. Crawford; 1, v.7.03, C. R. Jones; 3, Wickham (USNM); 4 ♂, 2 ♀ (AMNH); 1 ♀, Wickham (ANSP). *Duval County*. San Diego, 1, v.23.—, Hubbard & Schwarz (USNM). *El Paso County*. El Paso, 1 ♂ (CAS); 2 ♂, 2 ♀ (AMNH). *Falls County*. Little Brazos R. at St. Rd. 6, 11 ♂, 7 ♀, x.18.56, JRZ (NMSU). *Gonzales County*. Harwood, 1, Wickham (USNM). *Grayson County*. Lake Texoma, below the dam, 4 ♂, 1 ♀, x.19.56, JRZ (NMSU). Sherman, 17 ♂, 17 ♀, vi.14.57, D. R. Lauck (USNM). *Grimes County*. Singleton, 2 m. N., 2 ♂, 3 ♀, x.18.56, JRZ (NMSU). *Harris County*. Houston, 11, vi.15.32, Harwood; 1, vii.1.39, Vick (CNL). Seabrook, 1 ♀, viii.6.—, J. W. Green (CAS). *Harrison County*. Karnack, 6 ♀, vi.17.58, R. L. Fischer (MCHS). *Hays County*. Dripping Springs, 1 ♂, 1 ♀, viii.9.42, W. S. & E. S. Ross (CAS). *Hidalgo County*. Edinburg, 11, ii.23.36, J. G. Needham (CNL). *Hopkins County*. Sulphur

Springs, 1 ♂, 2 ♀, x.17.56, JRZ (NMSU). *Davis County*. Davis Mtns., Elbow Can. Crk., 1 ♂, 3 ♀, x.27.61; Madero Can., 1 ♀, x.27.61; Davis Mtns., 4 ♂, x.27.61, JRZ (NMSU). *Jefferson County*. Pt. Arthur, 3 ♂, 4 ♀, x.18.48, O. Bryant (CAS). *Jim Wells County*. Alice, 8 m. NE., 9, viii.25.35, C. E. Burt (USNM). *Kerr County*. Kerrville, 10, i.22.07, F. C. Pratt (USNM). *Kleberg County*. Kingsville, 34, C. T. Reed (CNL); 3 ♂, 4 ♀, x.20.61, B. McDaniels (NMSU). Riviera, 1, ii.28.36, J. G. Needham (CNL). *Lee County*. Fedor, 3 ♂, 2 ♀, v.—.— (CNG). Lexington, 1, x.—.09, Berkiman (CAS). County, 1, J. D. Sherman, Jr. (USNM); 1, v.—.10, Shoemaker (USNM); 1 ♂, 3 ♀, ix.—.09 (CAS). *McLennan County*. Waco, 12 m. S., 2 ♀, x.18.56, JRZ (NMSU). *Nueces County*. Corpus Christi, 1, v.10.44, F. R. DuChanois (USNM). *Randall County*. Palo Duro St. Pk., 1 ♂, viii.7.61, H. R. Burke (TAM). *Refugio County*. Refugio, 1 ♀, vi.9.60, F. N. Young (UMMZ). *Sutton County*. Sonora, Dry Devils' River, 1 ♂, xi.5.49, O. Bryant (CAS). *Titus County*. Mt. Pleasant, 5 m. S., 2 ♂, 4 ♀, x.17.56, JRZ (NMSU). *Travis County*. Austin, 2, vi.28.—, Wickham (USNM); 3 ♂, 3 ♀, xi.16.28; 3 ♂, 2 ♀, xii.5.28; 1 ♂, xii.10.28; 1 ♂, iv.15.24, J. O. Martin (CAS). *Val Verde County*. Del Rio, 2 ♀, x.5.49, 1 ♂, xi.5.49, O. Bryant (CAS). *Victoria County*. Lolita, 1, vii.6.16, J. D. Mitchell (USNM). Victoria, 1, iii.20.01; 2, vi.10.14; 6, ix.18.14; 1, viii.25.15, J. D. Mitchell (USNM) *Washington County*. Brenham, 1, iv.16.07, R. A. Cushman (USNM). *Zapata County*. Zapata, 5, ii.26.36, J. G. Needham (CNL). **VERMONT.** *Bennington County*. County, 2 ♂, 2 ♀, viii.16.—, C. H. Roberts (AMNH); 1 ♂ (ANSP). **VIRGINIA.** *Bath County*. Warm Springs, 1 ♂, x.1.— (CAS). *Fairfax County*. Falls Church, 1, viii.—.14, St. George & Craighead (USNM). *Hansemond County*. Suffolk, 2 ♀, vi.27.76, Dimwock (MCZ). *Stafford County*. Fredericksburg, 1, viii.19.89; 2, iii.15.91; 2, iii.26.99; 1, ix.21.00, W. D. Richardson (USNM). **WEST VIRGINIA.** *Greenbriar County*. White Sulphur Springs, 1, vii.23.10, W. Robinson (USNM). **WISCONSIN.** *Dane County*. Madison, 1 ♂, ix.31.35, H. R. Doge (CAS). *Dodge County*. Beaver Dam, 1, vi.22.10, W. E. Snyder (USNM). *Sauk County*. Sauk City, 1, J. D. Sherman, Jr. (USNM). *Shawano County*. Cloverleaf, 1, viii.17.39, H. R. Dodge (CAS). **WYOMING.** *Goshen County*. Ft. Laramie, 3.5 m. W., 1 ♀, viii.19.65; 5.3 m. E., 1 ♀, viii.18.65; Jay Em, 2.5 m. N., 1 ♂, viii.20.65; Lingle, 3.8 m. E., 1 ♂, 1 ♀, viii.19.65, H. B. Leech (CAS).

MEXICO. — **CAMPECHE.** Champoton, 11 m. SW., 7 ♂, 5 ♀, xi.27.63; Chencholli, 1 ♂, 2 ♀, xi.28.63; Cuidad de Carmen, 4 m. E., 25 ♂, 27 ♀, xi.27.63, JRZ; Puerto Real, 2 m. W., 13 ♂, 9 ♀, xi.25.63, K. L. McWilliams (NMSU). **CHIAPAS.** Azufre (near Teapa), 5 ♂, 3 ♀, xi.26.63; Ocozucuatla, 6 m. W., 1 ♂, ix.1.63; Teapa, 5 m. N., 2 ♂, 1 ♀, xi.26.63, JRZ (NMSU). **COAHUILA.** Ramos Arizpe, 2 ♀, vii.7.63, JRZ (NMSU). **OAXACA.** La Ventosa, 50 m. N., 1 ♂, xii.14.55, J. C. Schaffner (UMMZ). Rd. 185, 15 m. N. of Junct. of Rd. 190 (about 20 m. N. of Juchitan), 1 ♂, ix.2.63, JRZ (NMSU). **SAN LUIS POTOSI.** Agua Zarca (near Platinito), 1 ♂; Antiguo Morelos, 1 ♂, iii.23.63; Comoca, Rio Axtla, 1 ♂, iii.23.63; Mante, 1 ♀, iii.23.63,

JRZ (NMSU). **TABASCO.** Villahermosa, 5 m. S., 11 ♂, 6 ♀, xi.26.63; 2 m. E., 6 ♂, 10 ♀, JRZ (NMSU). **TAMAULIPAS.** Magiscatzin, Rio Guayalejo, 2 ♂, iii.26.63, JRZ (NMSU). San Fernando, Rio Linares, 1 ♂ (det. as compared with type of *confusus* by FNY), vi.10.60, F. N. Young (UMMZ). San Jose, 5, iv.—.10, J. D. Sherman, Jr. (USNM). **VERACRUZ.** Catemaco, 1 ♂, 1 ♀, viii.26.62; Coatzacoalcos, 15 m. E., 10 ♂, 1 ♀, viii.26.62, JRZ (NMSU). Cotaxtla, 1 ♂, vi.13.58, D. Candia Z. (CAS). **YUCATAN.** Progreso, 5 m. S., 5 ♂, 7 ♀, xi.24.63; Uxmal, 5 ♂, 6 ♀, xi.25.63, JRZ (NMSU).

VIRGIN ISLANDS. — Anagarda, 16 ♂, 27 ♀, iii.31.25; St. Croix, 9 ♂, 17 ♀, iv.4.25; St. Thomas, 8 ♂, 7 ♀, ii.28.25 (AMNH).

PUERTO RICO. — Adjuntas, 1 ♂, 1 ♀, vi.8-13.15; Arecibo, 1 ♂, ii.—.99, Aug. Busck; 1 ♂, ii.11.55, D. L. Lauck; 7 ♂, 1 ♀, vii.30-viii.1.14 (AMNH). Bayamon, 3 ♂, 2 ♀, i.—.99, Aug. Busck (USNM). Caguas, 3 ♂, 1 ♀, v.28-29.15; Coama Springs, 3 ♂, 4 ♀, vii.17-18.14; 4 ♂, 4 ♀, ii.11.— (AMNH). Fajardo, 4 ♂, 3 ♀, ii.—.99, Aug. Busck (USNM). Isabella, 7 ♂, 3 ♀, i.4.15 (AMNH). Manati, 1 ♀, ii.12.55, P. J. Spangler (USNM). Porto Rico, 1, J. D. Sherman, Jr. (USNM); 1 ♂ (AMNH). San Sabastion, 1 ♂, i.25.99, Aug. Busck (USNM).

BRITISH WEST INDIES. — **BAHAMA ISLANDS.** Abasco Cays, Allans Cay, 2 ♀, v.9.53, E. B. Hayden; Andros Island, Coakley Town, 1 ♂, 1 ♀, iv.22.53, E. B. Hayden; Hatchet Bay, 1 ♀, iv.2.53, E. B. Hayden & L. Giovannoli; Cat Island, 1 ♂, 1 ♀, iii.21.53, E. B. Hayden; Crooked Island, Landrail Pt., 2 ♂, 2 ♀, iii.5.53, E. B. Hayden; Eleuthera Island, Governors Harb., 1 ♂, iii.31.53. Exuma Cay, 1 ♀, i.14.53, E. B. Hayden & L. Giovannoli; Grand Bahama, West Ind., 4 ♂, 2 ♀, E. B. Hayden; Grand Turk Island, 9 ♀, ii.19.53, E. B. Hayden; Great Inagua Island, Matthew, 12 m. N., 1 ♀, vi.29.53, E. B. Hayden, L. Giovannoli; Long Island, Deadman's Cayon, 1 ♂, 1 ♀, iii.11.53, E. B. Hayden & L. Giovannoli; N. Bimini Island, 1 ♂, vi.—.51, M. Cazier, C. & P. Vaurie; New Providence Island, Nassau, 1 ♂, i.3.53; 1 ♀, iv.5.53, E. B. Hayden (AMNH); 3 ♂, 4 ♀ (ANSP). Rum Cayon, 2 ♂, 4 ♀, iii.16.53, E. B. Hayden; S. Bimini Island, 3 ♂, 4 ♀, vi.—.51, M. Cazier, C. & P. Vaurie; 1 ♀, v.—.51, Cazier & Gertsch; 1 ♀, viii.10.51; C. & P. Vaurie; South Caicos Island, 1 ♂, 2 ♀, ii.11.53, E. B. Hayden & G. B. Rabb (AMNH).

CUBA. — Havana, 3 ♂, 1 ♀, Baker (CNG). Jutinica, Alto Sonto, 2 ♀, xi.9.24; Pinar del Rio, 1 ♂, 3 ♀, ix.9-24.13; 10 km. S. Pinar Rio, 2 ♂, 3 ♀, ix.12-22.13; 7-14 km. N. Vinales, 6 ♂, 13 ♀, ix.16-22.13; Cabanas, 5 ♀, 2 ♂, ix.5-8.13 (AMNH).

Laccophilus salvini Sharp (Figs. 62-69, 291-292)

Laccophilus salvini Sharp, 1882a, p. 291. *Holotype*: male, British Museum (Natural History), Guatemala, Guatemala; Sharp, 1882b, p. 10; Zimmermann, 1920, p. 25; Blackwelder, 1944, p. 74.

DIAGNOSIS. — The combination of posterior elytral blotch, black venter, sawlike ovipositor, and file in the male and female should separate *salvini* from

Figure 7. Distribution of *Laccophilus proximus* and *L. salvini*.

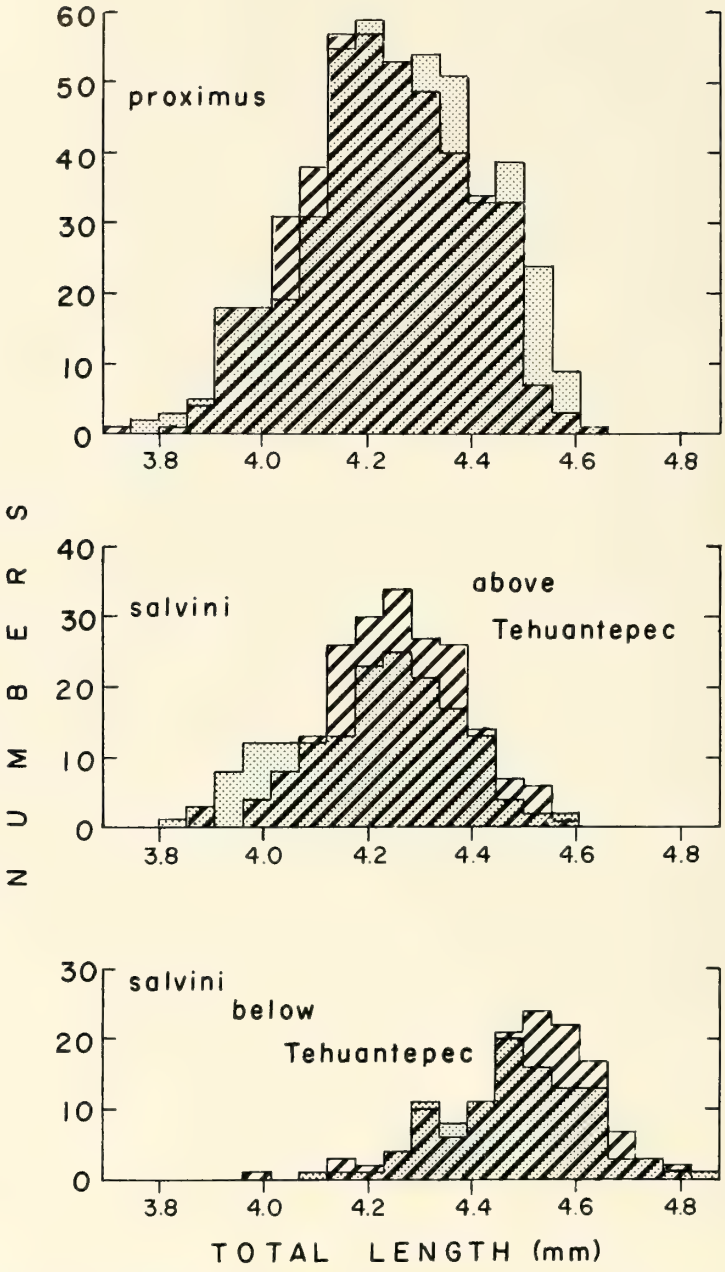

Figure 8. Histograms of length in *Laccophilus proximus* and *L. salvini*. Males are shown crosshatched; females, stippled.

all other North American *Laccophilus*. It differs from *mexicanus* and *pseudomexicanus* in its smaller size (average length, 4.15 to 4.30 mm as compared to average lengths of over 4.7 mm) and black elytral blotch, and from *fuscipennis, fasciatus,* and *proximus* by the black venter. Small females of *mexicanus* and large ones of *salvini* cannot always be reliably separated, since the blotch is sometimes weak and there is some size overlap. A mid-lateral elytral macula is almost always well-defined in *salvini,* but weak in *mexicanus*. Small specimens of *f. fasciatus* can be very similar dorsally, but the differently colored venter permits reliable separation. The aedeagi of *proximus* and *salvini* are similar enough to pose the question of whether they are specifically different.

DESCRIPTION. — Medium (length 3.9 to 4.8 mm; width 2.3 to 2.7 mm), dark brown, irrorated species; black beneath; metacoxal file prominent in males and weakly suggested in females; prosternal process short; ovipositor sawlike. COLOR. *Head*: pale brownish-yellow above and beneath, slightly darker at base of pronotum between the eyes; appendages yellow except for reddish-brown mandibles. *Pronotum*: pale brownish-yellow. *Elytra*: pale brownish-yellow background with irrorated pattern distinctly outlined (figure 291); strong tendency to completely suffuse and coalesce in the posterior half to form a nearly complete transverse fascia or blotch in some specimens; apex darkened, but usually a large clear area immediately anterior to apex; epipleura pale anteriorly and dark brown posteriorly. *Tergite VIII*: dark brown to black. *Venter*: prosternum, its process, prolegs, and mesolegs pale brownish-yellow; hind legs and postcoxal processes reddish-brown, darker at edge and on tarsi; mesothorax, metathorax, and metacoxal plates black; abdominal sternites from yellowish-brown to reddish-black with all degrees of intermediacy; males usually darker than females. *Genitalia*: generally reddish-brown with varying degrees of yellow. ANATOMY. *Microreticulation*: weakly double on head, pronotum, and elytra; secondary mesh discernible, but individual cellules still apparent. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: WH/PW, 0.70; LP/PW, 0.40. *Elytra*: epipleural flange small and seldom present; truncation slight. *Venter*: coxal file finely present in males, composed of about 28 to 30 lines; weakly present in females, but too fine to count; lobes of postcoxal process rounded laterally and projecting well beyond the midline; male and female last visible abdominal segments rounded, not truncated, and similar in outline; that of males slightly produced; female with faint groove on either side forming a marginate edge; crest fairly well-defined; asymmetrical in males; broad ridge in females; several rugae near the posterior margin; setigerous punctures thickest near the apex. *Legs*: male pro- and mesotarsi expanded in a dorsoventral plane; palettes easily visible at 20 power magnification; fifth tarsal segment of both pair of legs about one and one-half times as long as corresponding fourth; profemoral setae (5 to 6) shorter and finer than mesofemoral ones (5 to 6). *Genitalia*: oval plate with long acuminate tip and a well-defined median crest which has little anterior curvature; weak raised lines on either side; aedeagus evenly curved, narrowing toward tip; without distinctive knobs

Table 4. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus salvini*.

Locality		N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
Pima Co.,	♂	5	4.08 0.165	3.20 0.059	(3)	2.18 0.057	1.81 0.101	0.566	0.0292
Arizona	♀	5	3.92 0.062	3.12 0.070	....	2.18 0.062	1.74 0.024	0.577	0.0171
Ixtlan del Rio,	♂	45	4.14 0.109	3.30 0.084	(41)	2.30 0.063	1.86 0.053	0.563	0.0035
Nayarit	♀	46	4.12 0.133	3.27 0.109	(35)	2.32 0.092	1.85 0.067	0.566	0.0050
Ameca, Jalisco	♂	43	4.21 0.127	3.30 0.137	(34)	2.35 0.082	1.87 0.068	0.567	0.0054
	♀	48	4.16 0.171	3.24 0.141	(43)	2.31 0.086	1.84 0.073	0.568	0.0035
Autlan, Jalisco	♂	48	4.26 0.110	3.30 0.093	(47)	2.37 0.059	1.88 0.044	0.570	0.0025
	♀	37	4.27 0.138	3.33 0.118	....	2.37 0.079	1.89 0.056	0.567	0.0027
Cuernavaca,	♂	23	4.28 0.138	3.37 0.109	(17)	2.38 0.172	1.91 0.069	0.567	0.0037
Morelos	♀	16	4.21 0.131	3.30 0.119	(14)	2.36 0.075	1.86 0.064	0.563	0.0048
Las Casas,	♂	47	4.50 0.143	3.56 0.123	(37)	2.50 0.085	1.98 0.076	0.558	0.0027
Chiapas	♀	24	4.47 0.164	3.54 0.129	....	2.50 0.100	1.98 0.074	0.558	0.0032
Comitan, Chiapas	♂	48	4.41 0.167	3.50 0.138	(46)	2.45 0.088	1.96 0.071	0.560	0.0026
	♀	48	4.44 0.146	3.52 0.121	....	2.47 0.089	1.96 0.062	0.557	0.0025
Chimaltenango,	♂	39	4.44 0.102	3.51 0.106	(33)	2.44 0.064	1.97 0.062	0.561	0.0050
Guatemala	♀	34	4.42 0.085	3.49 0.088	....	2.45 0.070	1.95 0.072	0.559	0.0067

or sculpturing; right paramere with blunt apex; apex of left paramere slightly asymmetrical; ovipositor with about 13 sawlike teeth.

NOMENCLATURAL NOTES. — Confusion in this taxon has been limited to it being mistaken for *L. confusus* in Arizona (Leech 1948a). The specimens were somewhat lighter than usual beneath; and since *salvini* and *proximus* (= *confusus*) are so similar, it is not surprising that the Mexican synonym was given to those individuals.

VARIATION. — The most apparent pattern variation is the degree to which the posterior part of the elytra has darkened. Some have a fascia or blotch nearly as complete as that of *L. f. fasciatus,* while others have little enough to be confused with *mexicanus.* The darkening is stronger in specimens from south of the Isthmus of Tehuantepec. Arizona specimens have lighter venters than other *salvini* and, except for the elytral pattern, are very close to *proximus.*

Populations from south of the Isthmus are larger than those to the north. A comparison of mean pronotal widths for males from Morelos and Las Casas, Chiapas, which are the closest samples on either side of the Isthmus, give a highly significant difference (Table 4). The samples from Comitan, Chiapas, and Guatemala agree with the Las Casas population. One could readily justify describing the northern populations as a different race, but I have not done so. The population from Arizona appears even more different than that from Central Mexico, but only ten specimens were available for comparison. The species shows considerable geographic variation and deserves additional descriptive analysis (Fig. 8).

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. salvini* occurs from southern Arizona to Guatemala. At present there is a gap in the records from northern Sonora to Nayarit. Too few collections have been made on the west edge of the Sierra Madre Occidental to consider this more than a collecting gap, however. It is common in Nayarit, Jalisco, Michoacan, and Morelos, and further south in Chiapas and Guatemala. It generally is found between two and seven thousand feet (Fig. 7).

Like *proximus* it seems to be a pioneer species in newly formed situations at higher altitudes. It seldom occurs on the coastal lowland. Grassy margined ponds are the most common habitat.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ARIZONA.** *Pima County.* Tucson, Bear Can., 1 ♂, iii.18.46; 2 ♂, 3 ♀, iii.26.46, J. W. Green (CAS). Catalina Mtns., 2 ♂, 2 ♀, iv.18.—, Hubbard & Schwarz (USNM); 1 ♀, xi.8.34, K. Thomas (NMSU).

GUATEMALA. — Carcha (Dept. Alto V. P.), 9 ♂, 2 ♀, vi.23.66, Flint & Ortiz; Chimaltenango, 20 m. NW., 48 ♂, 40 ♀, viii.20.65, P. J. Spangler; Guatemala City, 20 m. S., 10 ♂, 7 ♀, vii.7.65, P. J. Spangler (USNM).

MEXICO. — **CHIAPAS.** Buchil (near), 1 ♂, viii.31.63; Comitan, 92 ♂, 69 ♀, viii.30.63; 13 m. W., 38 ♂, 40 ♀, viii.30.63; Ixtapa, 15 ♂, 6 ♀, viii.31.63; Ocozucuatla, 6 m. W., 1 ♂, ix.1.63, JRZ (NMSU). San Cristobal de las Casas, 1 ♂, 1 ♀, i.25.66, P. H. Raven & D. E. Breedlove (CAS); 38 ♂, 17 ♀, viii.28.63; 5 m. E., 17 ♂, 7 ♀, viii.28.63; 20 m. W., 3 ♂, 1 ♀, viii.30.63; Tuxtla Gutierrez, 10 m. W., 6 ♂, 5 ♀, ix.1.63, JRZ (NMSU). **COLIMA.** Trapechi (near Colima), 2 ♂, 6 ♀, vii.29.62; 15 ♂, 22 ♀, vii.30.62, JRZ (NMSU). **JALISCO.** Ameca, 25 km. E., 43 ♂, 51 ♀, iii.25.64, JRZ (NMSU). Atenquique, 15 m. NE., 3 ♂, 3 ♀, xii.5.48, H. B. Leech (CAS). Autlan, 53 ♂, 38 ♀, x.26.66, A. H. Smith & JRZ (NMSU). Barra de Navidad, 1 ♂, iii.18.61, C. O. Morse; Colima, 29 m. NE., 3 ♂, 1 ♀, xii.3.48, H. B. Leech (CAS). Cuidad Guzman, 5 m. N., 5 ♂, 1 ♀, vii.28.62; Guadalajara, 20 m. E., 4 ♂, 1 ♀, iii.25.64; 11 m. S., 8 ♂, 11 ♀, vii.30.62, JRZ (NMSU). Jiquilpan, 15-20 m. W., 1 ♂, 1 ♀, xi.30.48, H. B. Leech (CAS). La Huerta, 6 m. N., 8 ♂, 8 ♀, x.25.66, A. H. Smith & JRZ (NMSU). Mazamitla, 17 m. S., 10 ♂, 8 ♀, xii.5.48, H. B. Leech (CAS); 5 km. E., 1 ♂, 2 ♀, iii.27.64, JRZ (NMSU). Tala (near), 27 ♂, 17 ♀, iii.25.64; Tamazula, 5 ♂, 6 ♀, iii.27.64; Tecalitlan, 10 m. S., 6 ♂, 13 ♀, iii.27.64, JRZ; Tecolotlan, 12 ♂, 12 ♀, x.24.66, A. H. Smith & JRZ; Tehetlican (Rd. 110), 12 ♂, 12 ♀, vii.28.62; Tizapan (near), Rd. 15, 26 ♂, 17 ♀, iii.26.64, JRZ (NMSU). Tlaquepaque, 2 ♀, vii.—.53, N. L. H. Krauss (CAS). Union de Tula, 10 m. S., 9 ♂, 18 ♀, iii.28.64, JRZ (NMSU). La Venta de Mochitiltic, 5 ♂, 7 ♀, vii.20.55, R. B. Selander (CAS). **MEXICO.** Near Tonatico, 1 ♂, 2 ♀, viii.29.62, JRZ (NMSU). **MICHOACAN.** Carapan, 15 m. S., 2 ♂, xii.7.48, H. B. Leech (CAS). Jacona, 1 ♀, viii.11.57, D. R. Lauck (USNM). Jiquilpan, 8 km. E., 11 ♂, 10 ♀, iii.2.64; 11 m. W., 2 ♂, vii.28.62; Uruapan, 2 ♂, 1 ♀, iii.26.64; 10 m. S., 10 ♂, 16 ♀, iii.26.64, JRZ (NMSU). Zamora, 9 m. W., 3 ♂, 1 ♀, xii.6.48, H. B. Leech (CAS); 2 ♀, vii.28.62, JRZ (NMSU). **MORELOS.** Acatipaca, 4 ♂, 3 ♀, viii.29.62; Cuautla (near), 10 ♂, 8 ♀, viii.28.62, JRZ (NMSU). Cuernavaca, 14 m. S., 2 ♂, xii.8.48, H. B. Leech (CAS); 1 ♀, iv.15.46, J. D. Pallister (AMNH); 2 ♂, 2 ♀ (UMMZ). Puente de Ixtla, 3 ♂, 2 ♀, viii.29.62; Temixco, 3 ♂, 2 ♀, viii.29.62, JRZ (NMSU). **NAYARIT.** Ixtlan del Rio, 34 ♂, 21 ♀, ix.22.53; San Blas, 1 ♂, 2 ♀, ix.17-21.53, B. Malkin (CAS); 5 m. E., 2 ♂, 1 ♀, vii.31.62, JRZ (NMSU). Sierra de Zapotan, 1 ♂, xi.—.42, Eugenio Paredes (CAS). Tepic, 1 ♂, ix.15-17.53; 3 ♂, 3 ♀, ix.21-24.53; 19 m. SE., 1 ♂, 7 ♀, ix.24.53, B. Malkin (CAS); 2 ♀, xi.27.48; 15 m. SE.,

1 ♂, 6 ♀, xi.28.48; 25 m. SE., 6 ♂, 11 ♀, xi.23.48, H. B. Leech; 20.5 m. NW., 10 ♂, 3 ♀, xi.24.48, H. B. Leech (CAS). **OAXACA.** Camotlan (near), 3 ♂, 4 ♀, ix.3.64; Huajuapan, 2 km. S., 4 ♂, 2 ♀, ix.4.64, JRZ (NMSU). **PUEBLA.** Amatitlan, 9 m. N., 1 ♂, xii.10.48, H. B. Leech (CAS). Puebla(?), 1 ♂, vi.26.57, D. R. Lauck (USNM). **SONORA.** Aribaba (near Moctezuma), 1 ♂, 1 ♀, xii.15.62, JRZ (NMSU). Hermosillo, 3 ♀, vii.9-16.53, B. Malkin (CAS). Near Rancho Uriquepa, 1 ♀, vi.26.56, F. N. Young (UMMZ). **ZACATECAS.** Fresnillo, 16 m. NW., Rio Trujillo, 6600 feet, 1 ♀, vi.29.54, R. H. Brewer (CAS).

LACCOPHILUS MEXICANUS

This polytypic species is composed of three races in North America. It appears to be part of a complex that extends to southern South America. *Laccophilus chilensis* Sharp bears strong resemblance to this group. As yet, no intergrade zones have been found between the North American races. One suspected intergrade has been seen between *mexicanus* and *atristernalis*. It is a female, however, and does not permit a reliable determination of intergradation. The races are very much alike, and individuals of the two races mentioned above can be separated only on the basis of male genitalia. The southern race, *oaxacensis*, does show more differentiation, and details of pattern and size permit good separation between it and *mexicanus*. The ranges of the southern races are, apparently, completely allopatric with a gap of about 200 miles.

DESCRIPTION. — Medium to large (length, 4.2-5.4 mm; width, 2.4-3.1 mm) species, brown above and dark brown or black beneath; metacoxal file present; prosternal process short; ovipositor sawlike. COLOR. *Head*: it and its appendages yellow or light brown, darkening to light reddish-brown near the pronotum; mandibles also darkening toward tip. *Pronotum*: yellow to yellowish- or reddish-brown. *Elytra*: light yellowish-brown background with relatively even irrorations, anterior fingerlike detail of *maculosus* group generally lacking in *mexicanus* and *atristernalis*, but evident in *oaxacensis*; some tendency for suffusion and anastomosing of dots in posterior half and near the medium suture; dots frequently forming chains; suture dark brown; pattern limits ill-defined; epipleura pale anteriorly, dark in constricted posterior part. *Tergite VIII*: dark brown to black. *Venter*: prosternum, its process, fore and middle legs light brownish-yellow with reddish tinge; hind legs of about the same color with much stronger reddish highlights; mesosternum, metasternum, metacoxal plates, except postcoxal processes, very dark brown or black; abdominal segments variable from brownish-yellow to black; females with abdominal segments frequently pale except for the black hind margin of first visible segment, but other segments tend to be suffused with some dark brown or black.

Table 5. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus mexicanus*.

Laccophilus m. mexicanus

Locality		N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
Hidalgo Co.,	♂	48	4.86 0.174	3.28 0.146	....	2.74 0.107	2.14 0.079	0.561	0.0028
New Mexico	♀	48	4.69 0.225	3.73 0.188	....	2.66 0.132	2.09 0.104	0.561	0.0027
Chihuahua,	♂	30	4.98 0.137	3.93 0.111	(23)	2.80 0.102	2.20 0.060	0.559	0.0040
Chihuahua	♀	34	4.81 0.170	3.79 0.128	(32)	2.70 0.112	2.11 0.090	0.558	0.0039
Durango,	♂	18	4.89 0.142	3.82 0.127	(17)	2.72 0.098	2.13 0.072	0.557	0.0047
Durango	♀	43	4.80 0.150	3.80 0.123	(42)	2.73 0.106	2.13 0.079	0.560	0.0028
Pinos, Zacatecas	♂	14	4.79 0.139	3.76 0.102	(11)	2.67 0.069	2.09 0.080	0.555	0.0065
	♀	18	4.66 0.184	3.66 0.158	(15)	2.63 0.101	2.05 0.089	0.561	0.0040
Queretaro,	♂	25	4.82 0.247	3.78 0.189	(24)	2.67 0.132	2.12 0.103	0.562	0.0042
Queretaro	♀	15	4.77 0.161	3.75 0.154	....	2.67 0.099	2.12 0.074	0.565	0.0061
Jiquilpan,	♂	25	4.64 0.196	3.69 0.184	(20)	2.59 0.113	2.05 0.088	0.557	0.0042
Michoacan	♀	21	4.61 0.173	3.65 0.151	(20)	2.59 0.116	2.02 0.088	0.556	0.0049
Acambay, Mexico	♂	27	4.93 0.145	3.88 0.121	....	2.74 0.092	2.17 0.092	0.559	0.0050
	♀	8	4.76 0.154	3.76 0.130	....	2.67 0.086	2.11 0.082	0.561	0.0105
Puebla, Puebla	♂	18	4.93 0.213	3.90 0.150	(14)	2.17 0.084	2.17 0.084	0.558	0.0051
	♀	7	4.82 0.157	3.83 0.105	(6)	2.70 0.096	2.13 0.085	0.555	0.0078
Cape Region,	♂	9	4.78 0.238	3.75 0.201	(8)	2.66 0.118	2.11 0.088	0.564	0.0091
Baja California	♀	24	4.76 0.161	3.73 0.125	(19)	2.66 0.119	2.09 0.086	0.561	0.0045

Table 5 (*continued*)

Laccophilus m. atristernalis

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Solano Co.,	♂	36	4.84	0.114	3.82	0.111	(35)	2.75	0.070	2.17	0.053	0.569	0.0052
California	♀	36	4.72	0.156	3.69	0.133	....	2.69	0.092	2.12	0.112	0.574	0.0087
Churchill Co.,	♂	14	4.55	0.104	3.61	0.100	(13)	2.63	0.205	2.04	0.059	0.567	0.0079
Nevada	♀	18	4.49	0.210	3.54	0.190	....	2.56	0.124	2.02	0.109	0.570	0.0068
Nye Co., Nevada	♂	16	4.74	0.196	3.77	0.136	(10)	2.78	0.102	2.15	0.098	0.571	0.0059
	♀	13	4.64	0.197	3.65	0.157	(11)	2.66	0.115	2.09	0.094	0.573	0.0082
Laccophilus m. oaxacensis													
Nochixtlan,	♂	15	4.98	0.217	3.94	0.201	(8)	2.83	0.191	2.19	0.113	0.557	0.0036
Oaxaca	♀	16	4.79	0.172	3.80	0.145	(10)	2.81	0.115	2.13	0.084	0.561	0.0034
3 mi. north of	♂	26	5.10	0.148	4.09	0.136	....	2.91	0.112	2.28	0.070	0.558	0.0030
Oaxaca	♀	20	5.08	0.149	4.05	0.125	(18)	2.95	0.079	2.26	0.055	0.558	0.0033
3 mi. south of	♂	40	5.14	0.136	4.09	0.107	(26)	2.94	0.072	2.29	0.052	0.561	0.0029
Oaxaca	♀	48	5.05	0.119	4.05	0.099	....	2.92	0.083	2.26	0.062	0.558	0.0027
Ejutla, Oaxaca	♂	22	4.99	0.134	3.97	0.125	(18)	2.83	0.093	2.21	0.067	0.558	0.0029
	♀	14	4.88	0.175	3.90	0.145	....	2.81	0.136	2.15	0.084	0.552	0.0035
El Tule, Oaxaca	♂	29	5.05	0.167	4.02	0.136	(27)	2.90	0.095	2.25	0.089	0.558	0.0033
	♀	34	4.92	0.248	3.92	0.209	(33)	2.84	0.162	2.19	0.110	0.559	0.0027

Genitalia: oval plate, aedeagus, and parameres with varying amounts of dark reddish-brown or yellowish-brown; ovipositor reddish-brown. ANATOMY. *Microreticulation*: finely meshed and only weakly double at best (finer and less impressed than in *maculosus*) on head, pronotum and elytra. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: WH/PW, 0.67 to 0.68; LP/PW, 0.40 to 0.41. *Elytra*: epipleural flange rare in *atristernalis* and *mexicanus*, but common in *oaxacensis*; truncation of elytral apices slight. *Venter*: coxal file prominent in males, composed of from 25 to 30 lines, laterally 10 or 15 more which are much weaker and not distinctly part of the file; a faint trace of file apparent in females; prosternal process with well-defined crest; lobes of postcoxal processes rounded and laterally projecting well beyond the midline; male last visible ventral abdominal segment slightly produced with or without rugae along hind margin; asymmetrical curving ridge on middle forming depression on left side or both sides; female last segment either subtriangular or rounded; slight crest in posterior half of segment. *Legs*: male pro- and mesotarsi noticeably enlarged in a dorsoventral plane, easily observed at 20 power magnification; fifth tarsal segment on pro- and mesolegs from one and three-quarters to twice as long as fourth; profemoral setae (5 to 6) shorter and finer than mesofemoral ones (5 to 7). *Genitalia*: oval plate with acuminate tip and well defined crest which anteriorly curves to the left; numerous raised lines on either side of the crest; aedeagus of complex sculpture and abruptly constricting near the apex; right paramere with small distinct conical apex; ovipositor with 13 to 15 sawlike teeth.

NOMENCLATURAL NOTES. — The biological situation in *L. mexicanus* seems to be a relatively uncomplicated problem, but the nomenclatural condition has been one of continuous confusion. This is understandable, since the species lacks the pattern and colors that might lead one to easily recognize and define the geographical races. Aubé described *mexicanus* in 1838 from a single specimen from Mexico. No further locality information was given. I have not seen his type. It is apparently not at the Institute Royal des Sciences Naturelles de Belgique in Brussels or in the Paris Museum. It appears to be lost; but since the writer has not visited the European museums that might contain the type, a neotype has not been designated in this paper. I have seen a female specimen from Guanajuato (Brussels Museum) compared by Regimbart, with the type, and I have also examined a male in the Paris Museum from the collection of Regimbart; from Durango, Mexico; both are what have been considered *mexicanus*. Without examination of the type, there cannot be certainty about the identity of *mexicanus*. The specimens from Guanajuato and Durango belong to a race that extends to south of Mexico

City and north into the southwestern United States. Two other races occur in North America, however.

Crotch (1873) described *atristernalis* from California. Sharp and Horn synonomized it with *mexicanus*. Leech (1948) maintained that *mexicanus* specimens from Oaxaca were different from the California and Lower California specimens. He mentions the elytral apices as pale in those from Oaxaca and dark in the ones from north of there. The male aedeagus is also different and supports Leech's observations. The specimens from Oaxaca are being described as a new subspecies. The material from California is heterogeneous, however, since there are two races in that state. The one in southern and Lower California is what is here considered to be typical *mexicanus*. The one from northern California, Oregon, Idaho, Nevada, and Utah is being retained as *atristernalis*. I have not been able to find Crotch's type of *atristernalis*, and California has proven to be too vague a locality. The type locality is being restricted to Woodside, San Mateo, California; and the type locality for the nominate race is being restricted to Guanajuato, Guanajuato, Mexico.

Aubé's *mexicanus* could have been either of the two races that occur in Mexico; but since there is no certain way of establishing which one he had in hand, it seems better to describe as new the race that has the more restricted distribution and retain *mexicanus* for the race that is common over most of the country. There appears to be no confusion of *mexicanus* with any other species of North American *Laccophilus*.

Laccophilus mexicanus mexicanus Aubé, new status
(Figs. 70-73, 75, 76, 81, 294)

Laccophilus mexicanus Aubé, 1838, p. 420. *Holotype*: location not known; type locality here restricted to Guanajuato, Guanajuato, Mexico. Sharp, 1882a, p. 820; Sharp, 1882b, p. 9; Zimmermann, 1917, p. 122; Leng, 1920, p. 77; Zimmermann, 1920, p. 22; Blackwelder, 1944, p. 74; Leech, 1948b, p. 401.

DIAGNOSIS. — The almost evenly irrorate elytra, black venter, and size are the best general characteristics of this race. Only examination of the male aedeagus will permit certain identification, however. *L. spergatus, L. mistecus mistecus, L. pseudomexicanus,* and *L. salvini* are sympatric with *mexicanus* and have the same general coloration and pattern above and beneath. The first three species are usually larger than *mexicanus,* and *salvini* is smaller; but some

Figure 9. Distribution of *Laccophilus mexicanus* and *L. pseudomexicanus.*

individuals overlap in size. All other species within the range of *mexicanus* are brown, reddish-brown, or yellow beneath.

VARIATION. — The most common variation in pattern is the degree to which the dots tend to fuse. There may be considerable fusion in the posterior half of the elytra; but unlike *salvini* or *fasciatus,* it is always reddish-brown and not black. The ventral, abdominal sclerites of females have varying amounts of brown or yellow instead of black. It is not a constant feature, however.

Size is variable, (Table 5) but there are no geographical trends. Males of some population samples (Mexico and Chihuahua, for example) may exceed an average of over 4.9 mm, while a sample of 25 males from near Guadalajara, Jalisco, average only about 4.64 mm. Females appear to be slightly smaller than males, with the means smaller for every locality. The peaks of the frequency distributions for males and females are at about 4.8 mm, but the profile of the males is displaced toward the right when compared to the females (Fig. 10).

The PW/EL ratio is remarkably uniform in nine localities extending from Baja California to Michoacan, which supports the general geographical similarity (Table 5).

GEOGRAPHICAL RANGE AND HABITAT PREFERENCE. — The northern limits of this race appear to be the southern edges of Colorado, Utah, and Nevada (Fig. 9). I have not seen any specimens from Nevada, but they should occur there. It also occurs in southern California from a line about even with Los Angeles County and Barstow. It reaches the tip of Baja California and probably occurs generally over the peninsula. Leech (1948b) records *mexicanus* in Baja as *atristernalis*. This race extends no farther south than about Kern County, California, however. The northeastern limits of *mexicanus* are less well known. It reaches southeastern Colorado, northeastern New Mexico, and is common in the Davis Mountains and Big Bend region of Texas. There is a dubious record of a single specimen taken from Edinburg, Texas (J. G. Needham, ii. 24.36, Cornell University Collection), which is about 300 miles out of the range. In Mexico *mexicanus*, along with *fasciatus*, is one of the most common species on the Plateau. The race reaches Jalisco, Michoacan, Mexico, and Puebla at about 5000 feet elevation. It also occurs in Veracruz, interior to the coastal lowlands. It is sympatric with four other very similar species, all of which may occur within a few miles of one another, with up to three species in the same pond. They are *salvini, pseudomexicanus, spergatus,* and *mistecus*. Without males, experience is needed to distinguish among this assemblage. Apparently, there is some selective factor that has produced the rather evenly irrorated brown dorsal pattern and the black venter that is common to these species.

L. m. mexicanus seems to be most common in transitory, grassy

margined ponds with mud bottoms. It is less common in gravelly streams. Its most frequent occurrence is above 3500 feet.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ARIZONA.** *Cochise County.* Benson, 1 ♂, 1 ♀, iii.25.24, O. Bryant (CAS); 2 m. E., 1 ♀, x.6.63, K. L. McWilliams (NMSU). Chiricahua Mountain, 1, vi.16.— (USNM); SWRS, near Portal, 1 ♀, vi.18.58, C. D. MacNeill (CAS); SWRS, 2 ♂, iv.26.56; 2 ♀, iv.8.56; 1 ♀, iv.21.56, E. Ordway; 2 ♂, x.1.55, M. Cazier (AMNH); Herb Martyr Lake, 1 ♀, ix.5.61, JRZ (NMSU). Fairbank, San Pedro River, 1, iii.12.13 (CNL). Huachucha City, 5 ♂, 3 ♀, ix.6.61, JRZ (NMSU). Huachucha Mtns., 3, v.7.53; Bear Canyon, 2, v.8.53, A. & H. Dietrich (CNL). Palomas, 1 (CNL); 2 (USNM). Rodeo, N.M., 2 m. NW., 2 ♂, ix.5.61; Tombstone, 5 m. N., 2 ♂, ix.5.61, JRZ; Wilcox, 11 m. W., 1 ♀, x.6.63, K. L. McWilliams (NMSU). *Coconino County.* Grand Canyon, Supai, 3500 feet, 1 ♀, viii.2.34, E. L. Bell (AMNH). *Graham County.* Geronimo, 1 ♀, iv.28.24, J. O. Martin (CAS). *Maricopa County.* Palo Verde, 1, vi.4.19, A. Wetmore (USNM). Phoenix, 11 ♂, 9 ♀, Chas. Palm (AMNH). Wickenberg, 1, xii.28.45, H. P. Chandler (BERK). *Pima County.* Arivaca, Arivaca Ck., 1 ♂, 1 ♀, vii.31.52, H. B. Leech & J. W. Green (CAS). Quitobaquito, OPCNM, 4, iv.11.53; 4, v.1.53, A. & H. Dietrich (CNL). Sta. Catal. Mtns., 1 ♂, iv.10.38, F. H. Parker (DAV). Tucson, 1, ii.4.20 (ARI); 3 ♂, 2 ♀, ix—.33; 2 ♀, vi.—.—, O. Bryant (CAS). *Santa Cruz County.* Nogales, 5 m. NW., 2 ♀, ix.6.61; Santa Rita Mtns., Florida Can., 2 ♂, xii.2.61, JRZ (NMSU). *Yavapai County.* Minnehaha, 1 ♀, Barber (AMNH). Prescott, 4, —.—.— (USNM); 5 ♂, 6 ♀, viii.—.— Barber (AMNH). *Yuma County.* Fort Yuma, 8, vi.4.— (USNM). Yuma, 2 ♂, viii.24.06 (FM). **CALIFORNIA.** *Imperial County* Brawley, 3, viii.8.14; 7, iii.—.16, J. C. Bradley (CNL); 2 ♀, iii.—.16 (CAS). Callipatria, 1 ♂, xi.14.23, R. C. Casselberry (AMNH). Desert Shores, 20 m. S., 2 ♂, 1 ♀, iv.24.62, JRZ (NMSU). Salton, 1, viii.—.20 (USNM). Westmoreland (near), 1 ♂, iv.24.62, JRZ (NMSU). County, 1 ♂, v.24.25 (CAS); 1 ♂, 1 ♀, iv.3.24 (CNG). *Los Angeles County.* Claremont, 2 ♂, 4 ♀, Baker (CNG). Los Angeles, 1 ♂, —.9.19 (CAS). Los Angeles, 3, Coquillet, 1, W. D. Richardson (USNM). St. Ana Can., 1, ii.27.26, A. J. Muchmore (MCZ). *Orange County.* Laguna, 1 ♀, ix.9.—, F. E. Winters (CAS). Laguna Beach, 1, —.—.— (CNL). *Riverside County.* Coachella Valley, 4 ♂, 1 ♀, v.25.28, Van Dyke (CAS). Palm Can., Palm Springs, 1 ♀, vii.13.97, A. P. Morse (MCZ). Riverside, 3, F. E. Winters (CNL); 2 ♂, 6 ♀, F. E. Winters (CAS). County, Sonorian (sic!) Region, Colorado River, on some, 3 ♂, 2 ♀, F. E. Winters (CAS). *San Bernardino County.* Barstow, 1 (USNM). Needles, 1 (USNM); 2 ♂, 2 ♀, Wickham (AMNH). *San Diego County.* Escondito, 12 m. N., 1, ii.20.53, R. K. Benjamin (USNM). San Diego, 2 ♀, viii.19.37, F. W. Furry (LACM). **COLORADO.** *Huerfano County.* Near Walsenberg, 1 ♂, 1 ♀, viii.18.61, JRZ (NMSU). *La Plata County.* Durango, 14 m. S., 1 ♂, vii.28.66, A. H. Smith (NMSU). **NEW MEXICO.** *Bernalillo County.*

Albuquerque, 10; 3, vii.2.—; 2, x.18.19 (USNM); 1 ♂, 1 ♀, Wickham (CAS); 6 ♂, 2 ♀, 2 ♂, H. F. Wickham (AMNH); 4, vii.4.— (ISU). *Catron County.* Glenwood, 2 ♂, 2 ♀, iv.14.65, A. Smith, R. Smith & JRZ (NMSU). Quemado, 10 m. N., 3 ♀, vii.17.63, R. D. Ohmart (NMSU). Reserve, 1 ♀, iv.15.65, A. Smith, R. Smith & JRZ (NMSU). *Colfax County.* Cimarron, 10 m. N., 2 ♂, vii.15.65, A. H. Smith (NMSU). Maxwell (near), 1 ♂, 1 ♀, viii.14.61, JRZ (NMSU). *Dona Ana County.* Las Cruces, 1 ♂, x.1.62, K. L. McWilliams; 4 ♂, 3 ♀, vii.6.61, E. E. Staffeldt & JRZ (NMSU). Mesilla, 1 m. SW., 5 ♂, 7 ♀, viii.1.61 (NMSU); Mesilla, Mesilla Dam, 1 ♂, iv.25.24, J. O. Martin (CAS). Mesquite, 1 ♂, vii.10.61, JRZ (NMSU). *Grant County.* Cliff, 12 m. S., 5 ♂, 13 ♀, iv.14.65, A. Smith & JRZ (NMSU). *Harding County.* Mosquero, 10 m. E., 1 ♀, x.23.65, A. H. Smith (NMSU). *Hidalgo County.* Animas, 1 m. S., 3 ♂, vii.31.65, H. B. Leech (CAS); 32 m. S., Day Ranch, 2 ♂, vii.31.65, H. B. Leech & Van Tassel (CAS); 5 m. S., 1 ♀, vii.24.61, JRZ (NMSU); 12 m. SE., 50 ♂, 70 ♀, xi.23.62, K. L. McWilliams (NMSU). Cienega Lake (near Rodeo), 5 ♀, vii.17.64, R. H. Arnett, Jr. & E. Van Tassel (CUA). Near Cloverdale (30 m. S. Animas), 5 ♂, 7 ♀, vii.24.61; Gary, 5 m. W., 7 ♂, 2 ♀, vii.24.61; Lordsburg, 12 m. W., 7 ♂, 2 ♀, vii.24.61; Lordsburg, 12 m. W., 7 ♂, 6 ♀, x.6.63, JRZ; 13 m. E., 2 ♂, 2 ♀, x.6.63, K. L. McWilliams; Roadforks, 2 ♀, ix.5.61, JRZ (NMSU). Rodeo, 12 m. N., 1 ♂, ix.5.61, JRZ (NMSU). *Luna County.* Columbus, 1 m. S., 9 ♂, 7 ♀, vii.17.61, JRZ; Deming, 16 m. W., 2 ♂, x.6.63, K. L. McWilliams (NMSU). *Mora County.* Mora, 10 m. S., 1 ♀, v.1.66, A. H. Smith (NMSU). *Otero County.* Pinon, 40 m. S., 3 ♂, vii.29.63, R. D. Ohmart (NMSU). *Quay County.* Tucumcari, 10 m. W., 2 ♂, ix.10.63, K. L. McWilliams (NMSU). *Rio Arriba County.* Abiquiu, 3 ♂, 1 ♀, ix.16.49, O. Bryant (CAS); Canjilon, 1, vii.6.30 (AMNH). Dulce, 1 ♂, vi.24.65; Ojo Caliente, 1 ♂, vi.23.65, A. H. Smith, R. L. Smith & JRZ (NMSU). *San Juan County.* Fruitland, 1 ♀, xi.14.62; Newcomb, 2 m. N., 1 ♂, vii.9.63, R. D. Ohmart (NMSU). **TEXAS.** *Brewster County.* Big Bend Ntl. Park, Boquillas, 1 ♂, viii.2.61; Marathon, 10 m. S., 1 ♂, viii.1.61, JRZ (NMSU). County, 1 ♂, v.3.27, J. O. Martin (CAS). *El Paso County.* Clint, 1 m. S., 5 ♂, 2 ♀, viii.2.61, JRZ (NMSU). El Paso, 1, vii.26.14; 1, vii.28.14, J. C. Bradley (CNL); 3 (NMSU); 3 ♂, 1 ♀ (AMNH). *Hidalgo County.* Edinburg, 1, ii.24.36, J. C. Needham (CNL). *J. Davis County.* Davis Mtns., 1 ♂, 1 ♀, x.27.61; Elbow Canyon Ck., 1 ♂, 1 ♀, x.27.61, JRZ (NMSU). Ft. Davis, 6 ♂, 3 ♀, iv.19.53, B. Adelson & M. Fashbauer (CAS). *Presidio County.* Marfa, 14 m. N., 1 ♂, vii.19.61, JRZ (NMSU). **UTAH.** *Washington County.* St. George, 1, vi.—.— (USNM); 3 ♂, 4 ♀, vii.—.—, Wickham (MCZ).

MEXICO. — **BAJA CALIFORNIA SUR.** Cabo San Lucas, 7.7 m. NE., 1 ♀, i.1.59, H. B. Leech (CAS). El Carrizal, 1 ♂, 3 ♀, iv.25.47, Ira La Rivers (BERK). La Paz, 8.2 m. W., 1 ♂, xii.31.58, H. B. Leech (CAS). Padarone, Arroyo Amarillo, 2 ♀, v.11.47; San Bartolo, 1 ♂, 1 ♀, v.1.47, Ira La Rivers (BERK). San Jose del Cabo, 1 m. SE., 1 ♂, 1 ♀, i.7.59, H. B. Leech (CAS).

San Luis Gonzaga, 12 m. E., 2 ♂, 7 ♀, v.22.47; Todos Santos, 2 ♂, 11 ♀, iv.10.47, Ira La Rivers (BERK). **CHIHUAHUA.** Camargo, 1 m. N., 9 ♂, 15 ♀, vii.25.62; Casas Grandes, 5 m. E., 9 ♂, 11 ♀, xii.20.64; Chihuahua, 43 m. N., 31 ♂, 25 ♀, xii.8.62; Colonia Juarez, 2 m. SW., 3 ♂, 2 ♀, xii.20.64; Hidalgo d. Parral, 10 m. S., 1 ♂, 2 ♀, xii.9.62, JRZ (NMSU). Parrita, 12 m. W., Santa Clara Can. (in Canon Prieto), 3 ♀, vi.30.47, M. Cazier (AMNH). Primavera, 3 ♀, vi.30.47, M. Cazier, W. Gertsch & R. Schrammel (AMNH). Sta. Barbara, 1 ♂, v.14.—, G. M. Bradt (AMNH). **DISTRITO FFDERAL.** San Jeronimo, 1 ♂, 1 ♀, vi.11.46, J. & D. Pallister (AMNH). Xochimilco, 1 ♀, iv.26.46, J. & D. Pallister (AMNH). **DURANGO.** Abasolo, 3 ♂, 8 ♀, vii.25.62, JRZ (NMSU). Durango, 1 ♂, 29 ♀, v.30.37, M. Embury (CAS); 16 ♂, 15 ♀, vii.26.62; 10 m. N., 1 ♂, 1 ♀, xii.9.62; 20 m. W., 16 ♂, 12 ♀, xii.10.16; Llano Grande, 10 m. E., 1 ♂, 1 ♀, xii.10.62; Navios (Rd. 40), 1 ♂, xii.10.62; Nombre de Dios, 4 ♂, 2 ♀, vii.26.62; 6 ♂, 6 ♀, vii.13.63; 9 ♂, 7 ♀, viii.21.63; San Juan del Rio, 3 ♂, 8 ♀, xii.9.62, JRZ (NMSU). Tapias, 6400 feet, 2 ♀, vi.20.61, R. A. Schreibner (MCHS). **GUANAJUATO.** Guanajuato, 2 ♂, 5 ♀, vi.20.57, D. R. Lauck (USNM). Irapuato, 1 ♂, 2 ♀, xii.22.55, Alan Gillogly (CAS); 5 m. S., 13 ♂, 7 ♀, vii.27.62; Leon, 5 m. S., 2 ♂, 4 ♀, vii.26.62, JRZ (NMSU). Near Cuitzeo, 30 m. N. Morelia, 1 ♂, 1 ♀, D. Breedlove (CAS). **JALISCO.** Ameca, 25 km. E., 1 ♂, 1 ♀, iii.25.64, JRZ (NMSU). Atenquique, 15 m. NE., 5 ♂, 2 ♀, xii.5.48, H. B. Leech (CAS). Guadalajara, 11 m. S., 4 ♂, 3 ♀, vii.30.62, JRZ; Barranca Oblato, 1 ♀, x.23.66, A. H. Smith & JRZ; Lagos de Moreno, 1 ♂, 10 ♀, vii.26.62, JRZ (NMSU). Mazamitla, 17 m. S., 3 ♀, xii.5.48, H. B. Leech (CAS); 5 km. E., 4 ♂, 2 ♀, iii.27.64; Near Tizapan, 11 ♂, 8 ♀, iii.26.64, JRZ (NMSU). Ojuelos de Jalisco, 12 m. S., 8 ♂, 14 ♀, xi.21.48, H. B. Leech (CAS). Tamazula, Junction Rd. 110 & Rd. to Cd. Guzman, 1 ♀, iii.27.64, JRZ; Tecolotlan, 6 ♂, 7 ♀, x.24.66, A. H. Smith & JRZ (NMSU). 15-20 m. W. Jiquilpan, 11 ♂, 11 ♀, xi.30.48, E. S. Ross (CAS). Zapotlanejo, 10 m. E., 9 ♂, 8 ♀, iii.25.64, JRZ (NMSU). **MEXICO.** Acambay, 14 ♂, 7 ♀, iii.27.63, JRZ (NMSU); 8.7 m. NW., 1 ♂, ii.3.53, I. J. Cantrall (UMMZ). Atlocomulco, 12 ♂, 1 ♀, iii.27.63; Tenango de Valle, 1 ♂, 2 ♀, viii.29.62, JRZ (NMSU). **MICHOACAN.** Carapan, 6 ♂, 12 ♀, vii.28.62, JRZ (NMSU); 15 m. S., 3 ♂, 7 ♀, xii.7.48, H. B. Leech (CAS). Cheran, 2 m. N., 2 ♀, iii.26.64; Ins. Morelos N. Pk., 2 ♂, 1 ♀, vii.27.62, JRZ (NMSU). Jacona, 5 ♂, 6 ♀, viii.11.57, D. R. Lauck (USNM). Jiquilpan, 11 m. W., 1 ♂, 2 ♀, vii.28.62; 8 km. E., 14 ♂, 6 ♀, iii.27.64, JRZ (NMSU). Lago de Patzcuaro, 1 ♂, iv.—.66, M. Rosas & P. Reyes (CAS). Morelia, 11 ♂, 4 ♀, viii.12.63; 10 m. N., 4 ♂, 2 ♀, vii.12.63; Near Cuitzeo, 6 ♂, 4 ♀, vii.27.62; Zamora, 8 ♂, 8 ♀, vii.28.62, JRZ (NMSU); 9 m. W., 4 ♂, 7 ♀, xii.6.48, H. B. Leech (CAS). **PUEBLA.** Acatzingo, 3 ♂, viii.28.62, JRZ (NMSU). Lago Alchichica, 7 ♂, 3 ♀, xii.19.48, H. B. Leech (CAS). Puebla, 10 km. E., 5 ♂, 4 ♀, viii.24.62, JRZ (NMSU). Lago Totolzingo, Rt. 136, km. 200, 2 ♂, 7 ♀, viii.2.66, Flint & Ortiz (USNM). **QUERETARO.** Queretaro, 1 ♂, 1 ♀, vi.20.57, D. R. Lauck (USNM); 16 ♂, 8 ♀, iii.27.63; San Juan del Rio, 8 ♂, 7 ♀, iii.27.63, JRZ (NMSU). **SAN LUIS POTOSI.**

San Luis Potosi, 2 m. S., 1 ♂, 1 ♀, xi.21.48, H. B. Leech (CAS). Santa Maria del Rio, 5 ♂, 10 ♀, iii.26.63, JRZ (NMSU). **SINALOA.** Mazatlan, 7 m. S., 1 ♂, 1 ♀, xii.11.62, JRZ (NMSU). **VERACRUZ.** Jalapa, 2 ♂, 2 ♀, Hoege (ANSP); 4 ♂, 2 ♀, Hoege (AMNH). **ZACATECAS.** Fresnillo, 6600 feet, 16 m. NW., Rio Trujillo, 9 ♂, 14 ♀,, vi.29.54; 45 m. W., 7700 feet, 1 ♀, vi.25.54, R. H. Brewer (CAS). Pinos, 10 m. S., 3 ♂, 5 ♀, viii.1.59; 5 m. S., 4 ♂, 1 ♀, viii.2.59, Ray Bandar (CAS). Sanchez Roman, 9 m. N., 5500 feet, 1 ♂, 1 ♀, vii.17.54, R. H. Brewer (CAS).

Laccophilus mexicanus atristernalis Crotch, new status (Figs. 77, 80, 293)

Laccophilus atristernalis Crotch, 1873, p. 400; type not known; type locality here restricted to Woodside, San Mateo County, California; Sharp, 1882a, p. 292; Sharp, 1882b, p. 9; Horn, 1883, p. 277; Leng, 1920, p. 79; Zimmermann, 1920, p. 22; Leech, 1948b, p. 401, Leech and Chandler, 1956, p. 314.

DIAGNOSIS. — This is the only irrorated *Laccophilus* in the northwestern United States with black on the venter. Females may be brown, but males are black. *L. biguttatus,* a non-irrorated species with a black venter, does occur rarely at higher elevations in the Sierras. All other sympatric *Laccophilus* are brown or some lighter color beneath. A few females of *L. m. decipiens* and *atristernalis* look so much alike that they are difficult to separate, but the former is larger and has a more detailed elytral pattern.

VARIATION. — The most striking variation is the weakening of the color on the venter of females from west of the Sierra Nevadas in California and Oregon. While it is geographical, it is not racial. Females of typical *mexicanus* from coastal southern California show the same modification. Males of *atristernalis* and females from east of the Sierras are as black beneath as any other races of *mexicanus*. *L. m. atristernalis* may have a more suffused and reddish-brown elytral pattern than *mexicanus*, also.

Males are larger than females (Table 5, Fig. 10) to about the same degree as in *mexicanus*. The pronotal mean for males from Churchill County, Nevada, is significantly different from the other two samples, but the latter two do not differ from one another. More samples are needed before assuming the difference is geographical and not local ecological variation, however.

L. m. atristernalis and *L. m. mexicanus* are about the same size, but the PW/EL ratio is different. The pronotum appears to be relatively wider in *atristernalis*. If this proves to be the case, then it is obvious that there is an important change in body proportions as well

as in aedeagus when *atristernalis* is compared to *mexicanus*. This change serves as additional reason for maintaining them as separate races.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. m. atristernalis* ranges from southern Oregon and southwestern Idaho to southern Nevada and California. Its eastern limit is central Utah. It appears to be the most common *Laccophilus* in the Interior Valley of California and around San Francisco Bay. It should intergrade with *mexicanus* in the southern part of California, Nevada, and Utah. There is a single female from Victorville, San Bernadino County, which has a dark brown venter and might be an intergrade (Fig. 9). Anderson (1962) collected *atristernalis* in Utah below 5100 feet in small shallow bodies with little current and heavy submergent and emergent vegetation.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **CALIFORNIA.** *Alameda County.* Berkeley, 4, F. E. Winters (CNL); 4 ♂, 5 ♀, F. E. Winters (CAS); 2 ♂, 2 ♀, x.15.30 (BERK). Piedmont, 1 ♂, xii.4.11, F. W. Nunenmacher (FM). *Butte County.* Oroville, 1 ♂, 1 ♀, v.29.21, R. C. Castleberry (AMNH). *Colusa County.* Colusa, 1, v.31.35, E. C. Zimmerman (NMSU); 1 ♂, 1 ♀, vi.15.57, T. R. Haig (DAV). Maxwell, 4, ix.5.18, A. Wetmore (USNM). *Contra Costa County.* Mt. Diablo, 1 ♀, v.29.36, M. A. Embury (BERK). *Fresno County.* Fresno, 2, iv.15.—, v.10.—, E. A. Schwarz (USNM); 1 ♀, vii.19.— (AMNH). Selma, 3 ♂, vii.17.51, viii.12.51, viii.15.51, R. C. Bechtol & K. V. Craig (DAV). *Glenn County.* Willows, 1 ♂, ix.8.49, M. Washbauer (BERK). *Inyo County.* Deep Springs, 3 ♂, vii.17.53, W. D. McLellan (DAV); 1 ♀, vi.19.54, P. Raven (CAS); 2 ♂, vii.15.53, J. R. Lattin (CAS). Keeler, 1, vii.6.14 (USNM); 1 ♂, 6 ♀, vii.6-14.00, Wickham (MCZ). Laws, 1 ♀, vii.26.38, C. L. Hubbs (UMMZ). Olancha, 3400 feet, 6, G. R. Pilate (USNM). Westgard Pass, 1 ♀, vi.18.58, M. E. Irvin (DAV). *Kern County.* Bakersfield, 1 ♀, v.5.31, A. T. McClay; 2 ♂, 3 ♀, vii.1.36, A. T. McClay (DAV); 1, iv.14.39 (BERK); 1 ♀, vii.—.29, R. F. Smith (BERK). Elk Grove, 1 ♀, ix.4.61, J. K. Drew (CAS). Shafter, 20 m. W., light trap, 1 ♀, vi.18.56, 1 ♂, 4 ♀, vii.20.56, T. R. Haig (DAV). Taft, 1, vii.5.37, H. M. Harris (ISU). Wasco, 3 ♀, vi.26.51, vi.27.51, vii.7.51, L. W. Isaak (DAV). County, 1 (USNM). *Kings County.* Hanford, 7, R. S. Wagner (USNM). County, 13 ♂, 9 ♀, vi.—.33 (FM). *Lassen County.* Amadee, 1 ♂, 1 ♀, vii.21-28.—, Wickham (MCZ); 2, vii.21-28.— (USNM). *Madera County.* Cottonwood Ck., 3 ♂, 2 ♀, viii.26.50, P. S. Bartholomew (CAS). Northfork, 1, iii.19.20, H. Dietrich (CNL); 1 ♂, vi.8.40, M. A. Cazier (AMNH). *Marin County.* County, 4, x.18.19, H. Dietrich (CNL); 1 (USNM); ix.2.—, E. C. Van Dyke (AMNH).

Merced County. Athlone, 2 ♀, viii.17.— (AMNH). Los Banos, 2 ♂, 1 ♀, iv.23.26, F. H. Wymore (DAV). Merced, 1 ♀, ix.—.42, W. F. Barr (FM). San Joaquin R. at Hwy 152, 1 ♂, ii.2.64, H. B. Leech (CAS). Yosemite Lake, 1 ♂, x.8.31, R. Von (UMMZ). *Modoc County*. Cedarville, 5 m. E., 2 ♀, vi.5.60, J. Schuh (SCH). *Mono County*. Benton, 1 ♂, vii.3.—, J. W. Tilden (UMMZ). Mammoth, 1 ♂, 1 ♀, viii.28.46, G. P. MacKenzie (MCZ); 1 ♂, 1 ♀, viii.28.46; 1 ♀, ix.20.45, G. P. MacKenzie (LACM). *Nevada County*. Sagehen, 1 ♂, vii.21.51, R. C. Blaylock (DAV). *Placer County*. Auburn, 1 ♂, iv.11.51, A. T. McClay; Colfax, 4 ♂, v.11.21; Roseville, 1 ♂, v.13.46, E. I. Schlinger (DAV). *Sacramento County*. Sacramento, 1 ♂, 3 ♀, v.20.44; 1 ♀, vi.9.44; 2 ♂, 5 ♀, vii.2.44; 3 ♂, vii.5.44; 3 ♀, vii.9.44; 4 ♂, 1 ♀, vii.11.44; 2 ♀, vii.19.44; 2 ♂, viii.5.44; 1 ♀, viii.10.44; 3 ♀, viii.18.44; 1 ♂, ix.6.44, A. T. McClay (DAV); 1, E. O. Essig (BERK). *San Joaquin County*. Banta, 4, xi.18.19, A. H. Hollonger (USNM). Stockton, 1, vii.8.08 (ARI). *San Mateo County*. Woodside, 1 ♂, vi.23.52, P. S. Bartholomew (CAS). *Shasta County*. Anderson, 1 ♀, vii.—.—, 1, viii.—.55, J. Willis (DAV). Hat Lake, 1 ♀, vi.2.47, E. E. Seibert; Lake Britton, 1 ♂, vi.29.47, C. H. Spitzer; Redding, 1 ♂, 3 ♀, vii.31.47, H. P. Chandler (CAS). *Siskiyou County*. Grenada, 1.3 m. E., 3 ♂, 3 ♀, viii.21.66, H. B. Leech (CAS). *Solano County*. Clarksburg, 2 ♀, vii.10.31; 12 ♂, 17 ♀, vii.15.31; 7 ♀, vii.20.31; 1 ♀, viii.13.31, A. T. McClay (DAV); 1, —.—.31 (BERK). Vacaville, 6 ♂, 6 ♀, vi.18.47; 1 ♂, 5 ♀, iv.15.47; 1 ♂, ix.10.47; 1, ix.21.47; 3 ♂, 1 ♀, ix.22.47; 9 ♂, 6 ♀, vii.13.48; 3 ♂, 7 ♀, vii.14.48; 1 ♂, 7 ♀, vii.15.48; 1 ♂, 1 ♀, vii.26.48; 12 ♂, 12 ♀, vii.27.48; 1 ♂, 2 ♀, vii.28.48; 1 ♂, 4 ♀, viii.6.48; 2 ♀, ix.6.48; 1 ♂, ix.10.48; 1 ♂, iv.8.49; 1 ♂, 2 ♀, vi.2.49; 1 ♀, viii.16.50, A. T. McClay (DAV). *Stanislaus County*. Del Puerto Canyon, 1 ♀, iii.22.46, W. F. Barr (FM). La Grange, 2.8 m. E., Vizard Ck., 1 ♂, viii.19.62, H. B. Leech (CAS). Newman, 1 ♂, x.13.53, C. G. Moore (DAV). *Sutter County*. Robbins, 6, x.11.31, H. P. Chandler (BERK). Yuba City, 1 ♂, v.10.42, H. P. Chandler (FM); 2, same data (BERK). *Tehama County*. Red Bluff, 1 ♂, vii.13.53, E. Yeomann (DAV). *Trinity County*. Carrville, 2400-2500 feet, 1 ♀, v.25.34 (FM). County, 1, v.23.34, T. H. G. Aitken (BERK). *Tulare County*. Hanford, 2 ♀, R. S. Wagner (CAS). Lindsay, 1 (CNL). Porterville, 1 ♂, viii.19.62, E. E. Ball (SCH). Springville, 5 m. W., 3 ♂, 4 ♀, iv.15.54, R. K. Benjamin (USNM). Three Rivers, 5 ♂, 4 ♀, Clberson (CNG). Visalia, 5 ♂, 5 ♀, vii.—.36, A. T. McClay; 2 ♂, viii.—.36, A. T. McClay (DAV). Woodlake, 1 ♀, vi.24.36, F. T. Scott (FM). County, 1 ♂, 1 ♀, vi.10.39, F. W. Nunenmacher (FM). *Yolo County*. Davis, 4 ♂, ii.26.61, V. L. Vesterby; 1 ♂, iv.23.61, D. R. Miller (DAV); 1 ♂, v.20.36, M. A. Embury; 2 ♀, v.—.36, J. J. Dubois (BERK); 2, vii.—.29 (BERK); 1 ♂, 1 ♀, v.22.25, F. H. Wymore; 1 ♀, x.—.46, A. L. Booth; 1 ♂, 1 ♀, iv.19.47, B. Stevens; 1 ♂, v.15.47, E. I. Schlinger; 5 ♂, 4 ♀, vii.27.48; 1 ♂, 1 ♀, vii.30.48; 2 ♀, viii.1.48; 1 ♂, 2 ♀, ix.9.48; 1 ♂, iii.31.50, A. T. McClay; 6 ♂, 3 ♀, viii.19.50; 3 ♂, 12 ♀, viii.13.51, R. C. Bechtol; 1 ♂, 1 ♀, iv.25.58, P. Paige; 1 ♀, ix.29.59, M. E. Irwin; 1 ♂, 3 ♀, x.15.60, D. Q. Cavagnaro; 1 ♂, 1 ♀, ix.24.60, D. Q. Cavagnaro (DAV). Dixon, 1 ♀, ix.14.47,

A. T. McClay (DAV). Elkhorn Ferry, 1 ♂, vii.9.51, E. I. Schlinger (DAV). Monticello, Putah Ck., 9, xii.—.17, J. C. Bradley (CNL). Rumsey, 1 ♂, vii.23.55, E. A. Kurtz (DAV). Woodland, 1 ♂, 1 ♀, vii.4.46 (BERK); 1 ♀, vii.4.47, E. G. Meyers (BERK). **IDAHO.** *Owyhoe County.* Hot Springs, 1 ♂, 2 ♀, vii.17.49; 1 ♀, vi.28.53, W. F. Barr (FM). **NEVADA.** *Churchill County.* Fallon, 14 ♂, 19 ♀, ix.2.59, F. D. Parker (DAV). *Elko County.* Ruby Valley, hot springs (65 m. S. Wells), 2 ♂, 2 ♀ (MCZ). *Lander County.* Battle Mtn., 37 m. S., hot springs, 1 ♀ (MCZ). *Lincoln County.* Maynard Lake, 3 ♂, 4 ♀, vii.12.38, Calhoun (CAS). *Mineral County.* Hawthorne, 4567 feet, 1, vii.27.— (USNM). Walker Lake, 1 ♂, xii.29.38, F. D. Parker (DAV). *Nye County.* Amargosa Hot Springs, 1 ♂, 3 ♀, iii.31.53, H. B. Leech (CAS). Ash Meadow Lodge (near Rhyolite), 10 ♂, 3 ♀, vii.10.54, N. L. Rump (AMNH); 3 ♀, iii.30.66, J. Schuh (SCH). Beatty, 3 m. N. Amargosa R., 1 ♂, 1 ♀, iii.29.66; 2 m. N., 2 ♂, 1 ♀, iii.29.66, J. Schuh (SCH). Springdale, 2, vi.11.36, J. G. Needham (CNL). *Washoe County.* Reno, 3, iii.6.40, J. G. Needham (CNL); 2 ♂, 2 ♀ (AMNH); 1 ♂, Wickham (ANSP); 1 ♂, 1 ♀, vi.3.40, La Rivers (MCZ); 1 ♂, v.23.41, I. La Rivers (CAS); 1 ♂, vi.3.40 (CAS). **OREGON.** *Harney County.* Crane Hot Springs, 25 m. SE., Burns, 4 ♂, 3 ♀, ii.25.65, K. Goedon (ORES). Fields, 5 m. NE., 1 ♀, vi.4.63, K. Goedon (ORES). Harney Lake, 0.5 m. S., 3 ♂, 3 ♀, vi.5.63, K. Goedon (ORES). *Jackson County.* Medford, 1 ♂, viii.29.44, A. T. McClay (DAV); 6 m. N., 1 ♂, 1 ♀, v.22.60, J. Schuh (SCH). *Lake County.* Albert Lake, 1 ♀, vi.6.58; 6 ♂, 3 ♀, vi.7.58, Vertrees & Schuh (SCH). **UTAH.** *Salt Lake County.* Salt Lake, 1 ♀, ix.23.57, R. D. Anderson (RDA). *Tooele County.* Timpie, 1 m. S., 1 ♀, v.1.57, R. D. Anderson (RDA). *Utah County.* Salem Pond, 4000 feet, 1 ♂, vii.17.41, H. P. Chandler (FM). Utah Lake, 1 ♂, vi.19.— (ANSP).

Laccophilus mexicanus oaxacensis, new subspecies

(Figs. 74, 78, 79, 295)

DIAGNOSIS AND DESCRIPTION. — This race differs from *L. m. mexicanus* and *L. m. atristernalis* in its larger size (Table 5, fig. 10), more detailed elytral pattern, more rounded female last ventral segment, more elongated aedeagus, and in the comparatively longer male fifth pro- and mesotarsal segments. The elytral pattern has the anterior fingerlike projections that are present in so many *Laccophilus*, but in neither of the other two races of *mexicanus*. Lateral clear areas are also more distinct, and there are frequently hollowed elongate marks on either side of the midline at about the level of the midlateral maculae. The epipleural flange, when it is present, begins just behind the midlateral macula. The male coxal file has 25 to 30 easily counted lines and about 15 much finer and less distinct ones. There is a weak file in females. The male last ventral segment has fewer rugae than *mexicanus*, and the female segment has depressions on either side of the median crest with protuberances anteriolateral to the depressions. The fifth protarsal segment is twice as long as the fourth; the

fifth mesotarsal one is one and seven-eighths as long as the fourth.

L. m. oaxacensis can be separated from the sympatric *L. mistecus mistecus* by its smaller size, different aedeagus, and the rounded (rather than slightly truncated) last ventral segment.

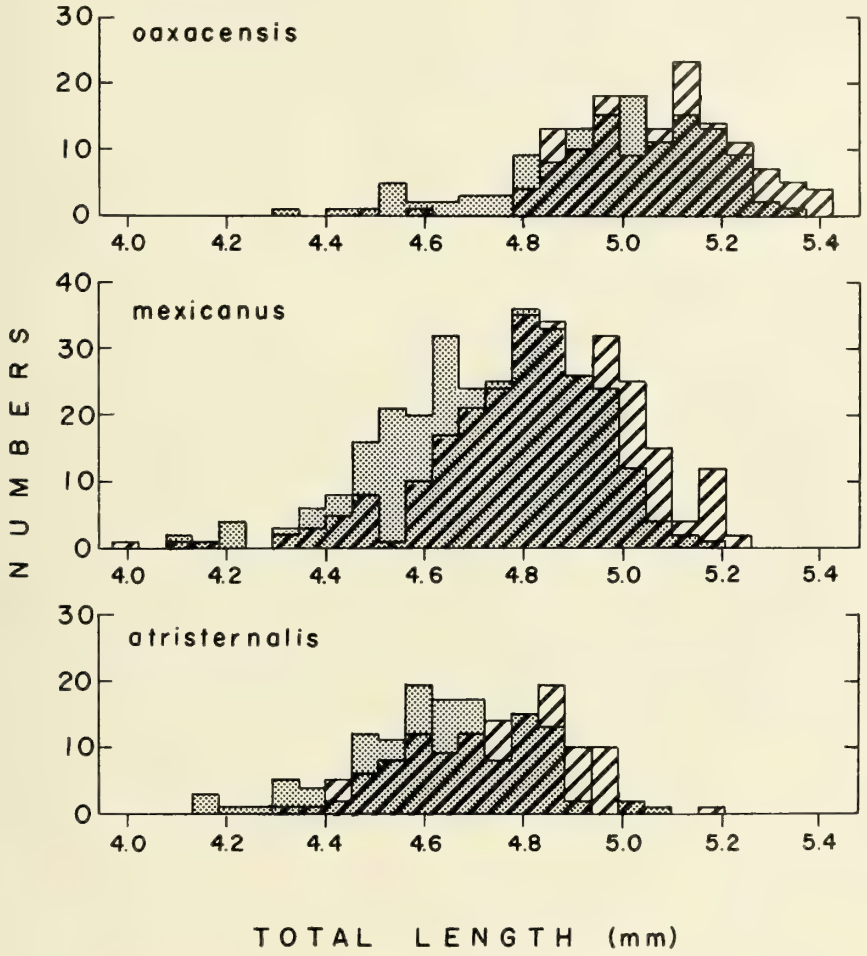

Figure. 10. Histograms of length of *Laccophilus mexicanus*. Males are shown crosshatched; females, stippled.

VARIATION. — The range in length varies from about 4.32 mm in the smallest female to about 5.40 mm in the largest male. Average lengths vary from 4.79 mm in the smallest female sample to

5.14 mm in the largest male sample (Table 5). Males are usually larger than females with a peak frequency at about 5.10 mm.

The most common variation in pattern is the degree to which the elytral pattern is margined or the occurrence and intensity of the mark that occurs on the disc near the midline. The amount of darkening on the abdominal sclerites is also variable.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This race has been collected only within fifty miles of the valley of Oaxaca at elevations from about 5000 to 7000 feet. It is one of the most common aquatic beetles in that area, however. It was usually taken in roadside ditches and shallow quarries, but occurs more infrequently in pools of grassy margined streams. It appears to prefer habitats with mud bottoms.

MATERIAL EXAMINED

Holotype male, *allotype* female; and five male and five female paratypes from three miles north of Oaxaca, Oaxaca, viii.25.63, J. R. Zimmerman, are deposited in the United States National Museum. Other paratypes deposited as follows: seven males and 19 females from eight miles north of Oaxaca, Oaxaca, xii.12.48, H. B. Leech, are in the California Academy of Science, San Francisco; a male and female also from the preceding locality are in the University of Michigan Museum of Zoology, Ann Arbor; two males and two females with the same locality data as the holotype are also in the University of Michigan Museum of Zoology and in the Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico.

Laccophilus pseudomexicanus, new species (Figs. 82-89, 296)

DIAGNOSIS. — This species belongs to the group with an irrorated pattern, metacoxal file, sawlike ovipositor, and has black on the venter. It is larger than *mexicanus* and *salvini,* the same size as *spergatus,* and is smaller than *mistecus.* It overlaps all of those, but *salvini,* however. Reliable separations require comparison of the aedeagi, but the pronotum is relatively longer in *pseudomexicanus* (LP/PW, 0.43) than in any of the others (0.40-0.41); and the males have the pro- and mesotarsi enlarged in the lateral as well as dorsoventral plane.

DESCRIPTION. — Large (length, 4.7 to 5.7 mm; width, 2.5 to 3.3 mm), brown, irrorated species; black on venter; metacoxal file present; prosternal process short; sawlike ovipositor. COLOR. *Head*: light yellowish-brown darkening to brown or reddish-brown on occiput near the pronotum; appendages yellow except mandibles which darken toward tip. *Pronotum*: light yellowish-brown; disc frequently with obscure darker paired marks; posterior margin and apex may be darker due to translucence rather than additional pigment. *Elytra*:

strongly irrorate with brown over almost complete surface, but midlateral spot present. *Tergite VIII*: dark brown to black. *Venter*: prosternum, its process, fore and middle legs light brownish-yellow with reddish tinge; hind legs of about the same color, but with much stronger reddish highlights; mesosternum, metasternum, metacoxal plates, except postcoxal processes, very dark brown or black; abdominal segments frequently pale except for the black hind margin of first visible segment; other segments often suffused with dark brown or black. *Genitalia*: oval plate, aedeagus, and parameres with varying mounts of dark reddish-brown or yellowish-brown; ovipositor reddish-brown. ANATOMY. *Microreticulation*: weakly double on head, pronotum, and elytra; cellules small and uniform. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: WH/PW, 0.68; LP/PW, 0.43. *Elytra*: large epipleural flange in some females; apical truncation marked. *Venter*: coxal file with about 25 to 30 fine lines which grade into the microsculpture of the metacoxae; prosternal process with well-defined crest; lobes of postcoxal laterally projecting well beyond midline; last visible ventral abdominal segment of male somewhat truncate, produced and with an asymmetrical crest nearly attaining the apex; a few small rugae along the posterior margin; female last ventral segment not truncated; median crest poorly defined, but several rugose-like lines converging toward midline near the apex; oblique striations present and strongly impressed; posterior margin reflexed; an oblique low ridge which does not attain the apex present on either side of median crest; setigerous punctures spread over surface, but thickest at middle and near the posterior margin. *Legs*: male protarsi expanded laterally as much as in the dorsoventral plane; mesotarsi expanded more dorsoventrally than laterally; palettes easily seen at 20 power magnification; male fifth tarsal segment about one and a half times as long as fourth in both pair of front legs; profemoral setae (5 to 9) margin finer and shorter than mesofemoral ones (6). *Genitalia*: oval plate large with sharp, slightly produced tip; median crest strong apically, but weakened to raised line anteriorly; raised lines on right side of crest diverge to right anteriorly; aedeagus bent only slightly, but with distinctive flattened knob at apex; ovipositor with 15 to 16 sawlike teeth.

VARIATION. — Males are about 0.2 mm larger than females (Table 6, Fig. 11). The sample from San Luis Potosi suggested that there is a racial difference between it and the population in Durango and Jalisco. The populations from the latter two areas, on the other hand, appear to be very similar. Elytral pattern differences support the same conclusion. Specimens from San Luis Potosi have local concentration of pigment on the elytral disc, while the others have a more uniform irroration.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This species is known only from the Mexican highlands in Durango, San Luis Potosi, Michoacan, and Mexico. It is found in both the

Table 6. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus pseudomexicanus*.

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Cuidad del Maiz,	♂	5	5.17	0.089	4.13	0.061	....	2.96	0.070	2.31	0.045	0.560	0.0064
San Luis Potosi	♀	2	4.97	.....	3.91	.....	....	2.89	.....	2.24	.....	0.572	.....
Llano Grande,	♂	21	5.40	0.189	4.22	0.133	(20)	3.06	0.133	2.38	0.091	0.564	0.0042
Durango	♀	25	5.21	0.153	4.09	0.131	....	2.99	0.116	2.31	0.079	0.565	0.0034
Zapotlenejo,	♂	6	5.26	0.143	4.18	0.122	....	2.96	0.105	2.34	0.069	0.560	0.0029
Jalisco	♀	6	4.93	0.255	3.98	0.159	....	2.83	0.177	2.21	0.098	0.557	0.0079
Mazamitla,	♂	24	5.34	0.135	4.25	0.112	(20)	3.05	0.096	2.38	0.065	0.562	0.0025
Jalisco	♀	27	5.06	0.175	3.97	0.119	(26)	2.88	0.119	2.24	0.086	0.564	0.0034

Sierra Oriental and Sierra Occidental and in the high valleys of the state of Mexico. I have collected it mainly in mountain stream pools with bottom of mud and volcanic gravel.

MATERIAL EXAMINED

Holotype male, *allotype*, and two paratypes of each sex with the following data are in the United States National Museum; 5 km. E. of Mazamitla, Jalisco, iii.27.64, J. R. Zimmerman. Other paratypes deposited as follows: seven males and three females from 15 miles east of Cuidad del Maiz, San Luis Potosi, xi.19.48, H. B. Leech, and one male from 15 to 20 miles west of Jiquilpan, Michoacan, xi.30.48, E. S. Ross, are in the California Academy of Sciences, San Francisco; one male from 8.7 miles NW. of Acambay, Mexico, 8300 feet, ii.3.53, I. J. Cantrell, and one female with the same data as the holotype is in the University of Michigan Museum of Zoology, Ann Arbor; and one male and one female with the same data as the holotype are also in the Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico.

MEXICO. — **DURANGO.** Llano Grande, 10 m. E. (Navios), 3 ♂, 6 ♀, xii.10.62; 3 m. E., 1 ♂, xii.10.62, JRZ (NMSU). El Salto, 16 m. E., 16 ♂, 21 ♀, vi.29.64, P. J. Spangler (USNM). **JALISCO.** Ameca, 25 km. E., 1 ♀, iii.25.64; Mazamitla, 5 km. E., 22 ♂, 27 ♀, iii.27.64. Near Tala, 1 ♂, 2 ♀, iii.25.64; near Tamazula, Rd. 110, 1 ♀, iii.27.64; Zapotlenejo, 7 m. E., 6 ♂, 6 ♀, JRZ (NMSU). **MEXICO.** Acambay, 1 ♂, 5 ♀, iii.27.63; Atlocomulco, 1 ♂, 1 ♀, iii.27.63, JRZ (NMSU). Ixtlahuaca, 6 m. S., 2 ♀, vii.12.52 (53?), R. & J. Selander (USNM). **MICHOACAN.** Jiquilpan, 8 km. E., 2 ♂, iii.27.64, JRZ (NMSU). **SAN LUIS POTOSI.** Agua Zarca (near Platinito), 5 ♂, 2 ♀, iii.25.63, JRZ (NMSU).

LACCOPHILUS MISTECUS

(Figs. 90-97, 298)

This species is composed of two races whose ranges are too incompletely known to be able to give more than a rough approximation of their distribution. They are both confined to Mexico and at the moment seem to be restricted to north of the Isthmus of Tehuantepec. The races approach one another in adjacent areas of Jalisco and Michoacan. There is a large collecting gap from Oaxaca through Guerrero and Michoacan. The principal difference between the two races is that the more northern one is light beneath and southern one is black or dark brown beneath. The species description is given under *L. m. aztecus*, new subspecies.

NOMENCLATURAL NOTES. — This species has several distinctive anatomical features and a limited distribution; consequently,

no nomenclatural confusion has developed. Sharp gives Parada as the type locality for this species. That locality is La Parada, Oaxaca, Mexico, which Selander and Vaurie (1962) locate as a "Hacienda and important collecting site on the north slope of the mountains west of Cerro San Felipe, which is just north of the city of Oaxaca; 7900 feet, about 17° 10′, 96° 40′." This means that the dark ventered race is the nominate one and that the light colored one should be described as new.

Laccophilus mistecus mistecus Sharp, new status

Laccophilus mistecus Sharp, 1882b, p. 9. *Holotype*: male, Parada, Mexico, British Museum (Natural History) (Salle Coll.); Zimmermann, 1920, p. 23; Blackwelder, 1944, p. 74.

DIAGNOSIS. — This is the largest of the species which have a metacoxal file, are irrorated brown above, and have black beneath. The truncate last ventral segment with its prominent lobe in the male is also a distinctive feature. *L. mistecus* resembles *spergatus* in this character; but there is some local accumulation of pigment on the elytra, in contrast to the evenly irrorated pattern of *spergatus*. The ventral crest on the oval plate of *m. mistecus* is much less prominent than in *spergatus*, also. *L. pseudomexicanus* has the last ventral segment untruncated in the male. Male aedeagi will separate all three of these species. *L. mexicanus* and *L. salvini* are much smaller with few individuals exceeding 5.4 mm. The description given for *L. mistecus aztecus* can be used for *L. m. mistecus* except, in the latter, the venter has black on it instead of paler shades of brown.

VARIATION. — Males are 0.25 mm to 0.30 mm larger than females (Table 8, Fig. 11). Males average just over 6.0 mm long and females just under 6.0 mm. The quantitative data conflicts with the separation into two races on the basis of the venter color. The sample from Michoacan more closely resembles the Acambay, Mexico, sample than the one from Oaxaca.

MATERIAL EXAMINED

MEXICO. — **JALISCO.** Mazamitla, 5 km. E., 2 ♂, iii.27.64; Tamazula (jct. Rd. 110), 2 ♀, iii.27.64, JRZ (NMSU). **MICHOACAN.** Jiquilpan, 11 m. W., 9 ♂, 6 ♀, vii.28.62, JRZ (NMSU). **OAXACA.** Nochixtlan, 2 km. S., 2 ♀, ix.4.64; Ixtlan de Juarez, 32 ♂, 50 ♀, viii.25.63, JRZ (NMSU). Tutla, 3 ♂, 1 ♀, xii.13.48, H. B. Leech (CAS).

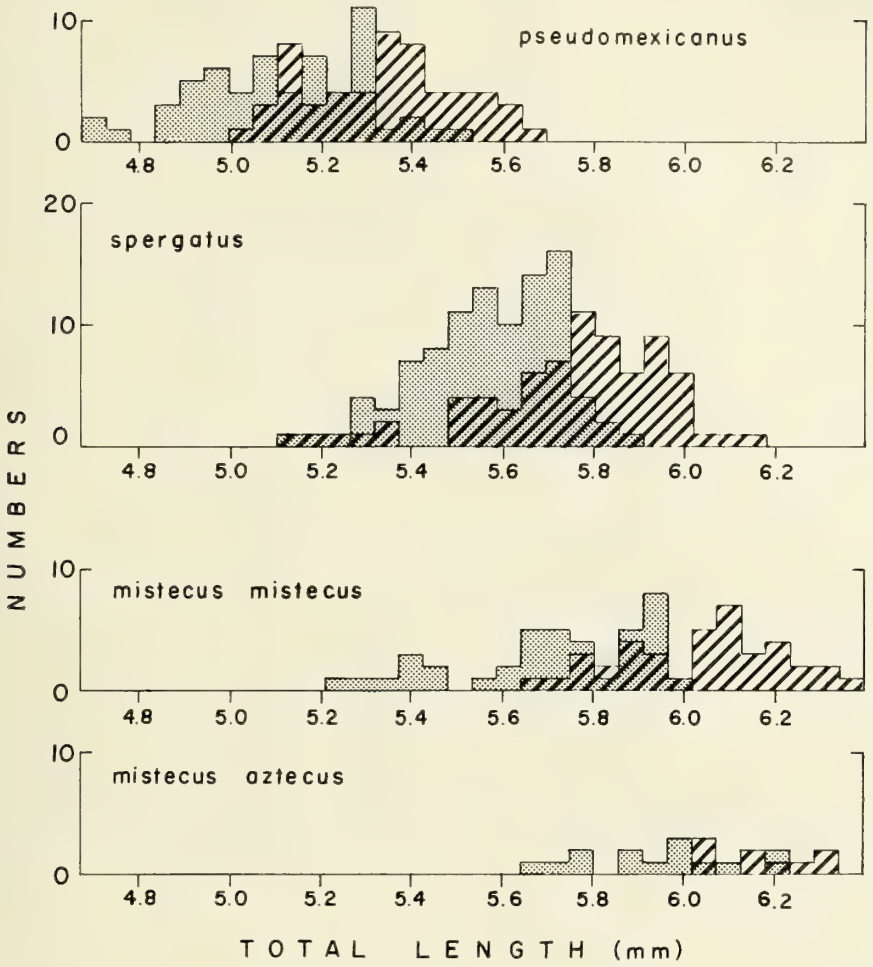

Figure 11. Histograms of length in *Laccophilus pseudomexicanus, L. spergatus, L. mistecus.* Males are shown crosshatched; females, stippled.

Laccophilus mistecus aztecus, new subspecies

DIAGNOSIS. — This differs from *L. m. mistecus* only in the presence of a pale venter. It is most likely confused with *L. maculosus shermani* which also occurs in central Mexico. They can be separated by elytral pattern details, rounded male segment in *shermani,* and the presence of an epipleural flange in females of the latter.

DESCRIPTION. — Large (length, 5.4 to 6.3 mm; width, 3.2 to 3.7 mm), brown, irrorated subspecies; metacoxal file present; prosternal process short; ovipositor sawlike. COLOR. *Head*: light yellowish-brown above and beneath; darker at pronotum between the eyes; appendages yellow except mandibles which are reddish-brown; gular sutures dark brown. *Pronotum*: light yellowish-brown with slight darkening in the posterior half of the disc. *Elytra*: fairly evenly irrorated with brown on a light yellowish-brown background, but with some suffusion and coalescence of dots; epipleura pale anteriorly and dark posteriorly. *Tergite VIII*: dark brown to black. *Venter*: yellowish-brown. *Genitalia*: variably yellowish-brown to reddish-brown to black. ANATOMY. *Microreticulation*: weakly double on head, pronotum, and elytra. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: WH/PW, 0.67; LP/PW, 0.40. *Elytra*: apical truncation slight; epipleura flange rarely, if ever, present. *Venter*: coxal file prominent in males, composed of 35 to 40 lines; prosternal process with well-defined crest; lobes of postcoxal processes rounded and laterally projecting posterior to midline; last male ventral abdominal segment truncated and produced, but less so than in *spergatus*; asymmetrical median crest and anteriolateral crests present, forming concavities on either side, the left larger than the right; corresponding female segment not truncated, but pyrimidal with a groove on either side forming an emarginate edge; setigerous punctures scattered over entire surface, but thickest near apex; crest broad and triangular, not ridgelike. *Legs*: male pro- and mesotarsi slightly enlarged in a dorsoventral plane; palettes easily observable at 20 power magnification; fifth protarsal segment not quite twice as long as fourth; fifth mesotarsal segment one and two-thirds as long as fourth; profemoral setae (5 to 6) shorter and finer than mesofemoral ones (5 to 7, usually 7). *Genitalia*: oval plate large with acuminate tip; its median crest curving slightly to the left and extending nearly to anterior margin; about twice as many lines on the right side of the crest as on the left; right paramere with blunt tip; left with smoothly rounded apex; aedeagus with cuneate projection about half the distance to the apex and one at the apex; ovipositor with about 15 sawlike teeth.

MATERIAL EXAMINED

Holotype male, *allotype*, and a male and female with the following data are in the United States National Museum; Acambay, Mexico, iii.27.63, J. R. Zimmerman. Other paratypes distributed as follows: one male, two females, 12 m. S. of Ojuelos de Jalisco, Jalisco, xi.21.48, H. B. Leech; one male, 10 m. S. Pinos, Zacatecas, viii.1.59, Ray Bandar, California Academy of Sciences, San Francisco, California; one male, 8.7 m. NNW. of Acambay, Mexico, 8300 feet, ii.3.53, I. J. Cantrell, and a female with the same data as the holotype, University of Michigan Museum of Zoology, Ann Arbor, Michigan; one male and one female with the same data as holotype, Departmento de Entomologia, Laboratorio de Vegetal Sanidad, Coyoacan, D. F. Mexico.

MEXICO. — **JALISCO.** Ojuelos de Jalisco, 12 m. S., 1 ♂, 2 ♀, xi.21.48, H. B. Leech (CAS). **MEXICO.** Acambay, 3 ♂, 5 ♀, iii.27.63, JRZ (NMSU); 8.7

Table 7. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus mistecus*.

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
							L. m. mistecus						
Oaxaca, Oaxaca	♂	29	5.98	0.164	4.83	0.112	(27)	3.51	0.088	2.71	0.067	0.560	0.0021
	♀	32	5.68	0.210	4.55	0.181	(22)	3.43	0.150	2.57	0.090	0.566	0.0042
Jiquilpan, Michoacan	♂	11	6.19	0.094	4.96	0.095	(10)	3.54	0.096	2.73	0.059	0.550	0.0070
	♀	8	5.86	0.129	4.75	0.122	....	3.39	0.090	2.60	0.074	0.546	0.0051
							L. m. aztecus						
Acambay, Mexico	♂	9	6.18	0.108	4.94	0.081	....	3.52	0.068	2.74	0.076	0.553	0.0061
	♀	14	5.95	0.170	4.77	0.149	(12)	3.43	0.107	2.65	0.067	0.555	0.0046

m. NNW., 8300 feet, 1 ♂, ii.3.53, I. J. Cantrell (UMMZ). Atlocomulco, 2 ♂, 5 ♀, iii.27.63, JRZ (NMSU). **MICHOACAN.** Quiroga, 1 ♂, 2 ♀, viii.10.57, D. Lauck (USNM). **SAN LUIS POTOSI.** S. Maria del Rio, 1 ♀, iii.26.63, JRZ (NMSU). **DURANGO.** Llano Grande, 10 m. E. (Navios), 3 ♂, 6 ♀, xii.10.62; 3 m. E., 1 ♂, xii.10.62, JRZ (NMSU). El Salto, 16 m. E., 16 ♂, 21 ♀, vi.29.64, P. J. Spangler (USNM). **JALISCO.** Ameca, 25 km. E., 1 ♀, iii.25.64; Mazamitla, 5 km. E., 22 ♂, 23 ♀, iii.27.64. Near Tala, 1 ♂, 2 ♀, iii.25.64; near Tamazula, Rd. 110, 1 ♀, iii.27.64; Zapotlenejo, 7 m. E., 6 ♂, 6 ♀, JRZ (NMSU). **MEXICO.** Acambay, 1 ♂, 5 ♀, iii.27.63; Atlocomulco, 1 ♂, 1 ♀, iii.27.63, JRZ (NMSU). Ixtlahuaca, 6 m. S., 2 ♀, vii.12.52 (53?), R. & J. Selander (USNM). **MICHOACAN.** Jiquilpan, 8 km. E., 2 ♂, iii.27.64, JRZ (NMSU). **SAN LUIS POTOSI.** Agua Zarca (near Platinito) 5 ♂, 2 ♀, iii.25.63, JRZ (NMSU).

Figure 12. Distribution of *Laccophilus mistecus, L. spergatus,* and *L. fuscipennis.*

Laccophilus spergatus Sharp (Figs. 98-105, 297)

Laccophilus spergatus Sharp, 1882b, p. 10. *Holotype*: female, Toluca, Mexico, British Museum (Natural History); Zimmermann, 1920, p. 26; Blackwelder, 1944, p. 74.

DIAGNOSIS. — Size, the remarkably evenly irrorate elytra, black venter, and strongly truncate last ventral segment in males and females separate this species from most other North American *Laccophilus*. Examination of the distinctive male genitalia may be necessary to separate it from some specimens of *mistecus, pseudomexicanus,* or *mexicanus,* however. The truncated female ventral segment of *spergatus* separates them from females of the last two species; but the male ventral segment of *mistecus* is truncated, and an examination of the aedeagus probably is necessary.

DESCRIPTION. — Large (length, 5.08 to 6.16 mm; width, 2.92 to 3.46 mm), brown evenly irrorated species; black beneath; metacoxal file present; prosternal process short; ovipositor rakelike. COLOR. *Head*: brownish-yellow above and beneath darkening to light brown at base of pronotum between the eyes; appendages yellow, except mandibles which are reddish-brown at tips; gular margin nearly black. *Pronotum*: pale brownish-yellow with slightly darker tinge on the disc. *Elytra*: irroration uniform over almost entire elytra and, while some of the dots occur in strings, there is little or no coalescence of dots nor suffusion of color between dots; in males some weakening of the irroration at humeral angle and along the sutural margin in the posterior half; epipleura pale anteriorly and dark reddish-brown posteriorly. *Tergite VIII*: dark brown to black. *Venter*: prothorax, its process, pro- fore and mesolegs all pale brownish-yellow; mesothorax, metathorax, and metacoxal plates dark brown to black except for lighter postcoxal processes; abdominal sternites generally pale yellow-brown to light reddish-brown, seldom black, except for the suture between the first and second segment; oblique striations usually darkened and prominent. *Genitalia*: variably pale yellow-brown to dark reddish-brown; usually evenly pigmented. ANATOMY. *Microreticulation*: faintly double, cellules more deeply impressed in females than males; hence the latter more shining. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: WH/PW, 0.68; LP/PW, 0.40. *Elytra*: epipleural flange absent; apical truncation slight, but more apparent in females than males. *Venter*: coxal file prominent in males (33 to 36 lines) and faintly suggested in females; prosternal process with crest well-defined in apical half; postcoxal processes rounded and laterally projecting beyond midline; last visible ventral abdominal segment of male sharply truncated with produced apex; median crest bent sharply to the left; strong ridges extending to the anterior segment are near the lateral margins; the larger left one with a marked depression situated posteriorly and medially; female segment less truncated than male and without definite median crest; apex flattened. *Legs*: male pro- and mesotarsi enlarged dorsoventrally and produced on either side; palettes easily visible at 20 power magnification; fifth tarsal segment of pro- and mesotarsi slightly less than twice as long as the corresponding fourth

Table 8. Variation ($\bar{X}$ mm $\pm$ SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus spergatus*.

Locality		N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
Toluca, Mexico	♂	40	5.83 0.168	4.69 0.127	(32)	3.33 0.096	2.55 0.053	0.543	0.0025
	♀	45	5.62 0.120	4.54 0.098	(44)	3.22 0.115	2.47 0.077	0.543	0.0032
Llano Grande, Durango	♂	24	5.72 0.164	4.61 0.140	(21)	3.24 0.107	2.52 0.073	0.545	0.0035
	♀	48	5.52 0.163	4.42 0.134	....	3.13 0.115	2.43 0.075	0.549	0.0027

segment; profemoral setae (5 to 7) shorter and finer than mesofemoral ones (5 to 7). *Genitalia*: oval plate and aedeagus are the most distinctive of the genus in North America; oval plate with rounded apex and small tip; large ventral keel bending to right anteriorly; several other large ridges to the right of the keel; aedeagus with two large lateral projections, one placed at about half the length and the other at the apex; right paramere with a produced slightly curved tip; ovipositor with about 16 sawlike teeth.

NOMENCLATURAL NOTES. — Sharp described this species from two female specimens; but fortunately, the female is sufficiently distinct from related species that identification and separation have good reliability. A precise locality was also given; and I have collected and examined numerous specimens from near Toluca, the type locality. I have examined the cotype which is from that same locality. F. N. Young has also sent me a drawing and notes on the type.

VARIATION. — Males are about 0.2 mm larger than females (Table 2, Fig. 11). The largest male and female measures 6.15 mm and 5.79 mm respectively. The means for lengths were about 5.78 mm and 5.57 mm. *L. spergatus* is relatively narrower than most irrorated species, and this is reflected in the WP/EL ratio (0.543 to 0.549). The difference in means in pronotal width between males from Mexico and Durango is significant by "t" test at the ninety percent level. Specimens from all localities resemble one another closely, however; and there do not appear to be any racial differences.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This species has a distribution limited to above 5000 feet from Durango to the state of Mexico. Collections were made from between 6000 to 9000 feet in small pools and sluggish streams or in mountain meadow seepage areas with fine, gravelly soils and grassy margins.

MATERIAL EXAMINED

MEXICO. — **DURANGO.** Durango, 20 m. W., 7500 feet, 7 ♂, 12 ♀, xii.10.62, JRZ (NMSU); 25 m. W., 20+, vi.29.64, P. J. Spangler (USNM). El Pino, 5 m. N., 1 ♀, vii.7.52, J. D. Lattin (BERK). El Salto, 16 m. E., 14 ♂, 16 ♀, vi.29.64, P. J. Spangler (USNM). Las Adjuntas, 2 m E., 2 ♂, 2 ♀, vi.30.52, J. D. Lattin (BERK). Llano Grande, 10 m. E. (Navios), 3 ♂, 23 ♀, xii.10.62; 3 m. E., 7 ♂, 25 ♀, xii.10.62, JRZ (NMSU). **MEXICO.** Acambay, 8.7 m. NNW., 8300 feet, 1 ♂, 2 ♀, ii.3.53, I. J. Cantrall (UMMZ); 23 ♂, 23 ♀, iii.27.63; near Atlahuaca, 10 ♀, 13 ♀, viii.29.62; Atlocomulco, 7 ♂, 8 ♀, iii.27.63, JRZ (NMSU). La Marquesa, 1 m. W., 4 ♂, xii.8.48, H. B. Leech (CAS). **QUERETARO.** San Juan del Rio, 1 ♂, 1 ♀, iii.27.63, JRZ (NMSU).

SAN LUIS POTOSI. San Luis Potosi, 2 m. S., 2 ♂, 1 ♀, xi.21.48, H. B. Leech (CAS). Santa Maria del Rio, 1 ♂, iii.26.63, JRZ (NMSU). ZACATECAS. Fresnillo, 61 m. W., 8100 feet, 1 ♂, 4 ♀, vi.25.54, R. H. Brewer (CAS).

Laccophilus fuscipennis Sharp (Figs. 106-113, 290)

Laccophilus fuscipennis Sharp, 1882b, p. 10. *Holotype*: female, Oaxaca, Mexico, Hoege, British Museum (Natural History); Zimmermann, 1920, p. 19; Blackwelder, 1944, p. 74.

DIAGNOSIS. — This is a medium-sized species which belongs to the group with brown irrorated elytra, pale venter, metacoxal file, short prosternal process, and sawlike ovipositor. It is sympatric with similar species that share some or all of those characters. It has several distinctive secondary sexual characters, however. It is dorsally similar to *mexicanus, salvini, proximus, spangleri,* and *vacaensis.* It differs from the first two in that they are dark beneath. *L. proximus, L. spangleri,* and *L. vacaensis* have considerably more pattern on the elytra than *fuscipennis* (figs. 289, 312-315). *L. fuscipennis* has a metacoxal file in the male and a sawlike ovipositor in the female, while *spangleri* and *vacaensis* lack files and have forklike ovipositors. It may be necessary, if pattern details are obscured, to compare males of *proximus* (*confusus* Sharp) and *fuscipennis,* which have quite different aedeagi.

DESCRIPTION. — Small or medium size (length, 3.9 to 4.7 mm; width, 2.3 to 2.7 mm), light brown, irrorated species, pale beneath; metacoxal file present; prosternal process short; ovipositor sawlike. COLOR. *Head*: yellowish-brown, with some darkening between the eyes at the base of the pronotum. *Pronotum*: yellowish-brown. *Elytra*: pale brownish-yellow background, irroration relatively uniform over the anterior half of the elytra, but considerable suffusion and darkening of color between irrorations in the posterior half; pattern margins poorly defined; apex usually without darker pigment; anterior half of epipleura pale; posterior half may be darkened or pale. *Tergite VIII*: dark brown. *Venter*: pale yellowish-brown with some reddish-brown highlights around the mesocoxae, the postcoxal processes, and hind legs. *Genitalia*: oval plate, bases of parameres, base and tip of aedeagus reddish-brown; parts of parameres and shaft of aedeagus reddish-yellow-brown. ANATOMY. *Microreticulation*: weakly double on head, pronotum and elytra. *Head*: supraclypeal seam arching upward at midline. *Pronotum*: WH/PW, 0.70; LP/PW, 0.40. *Elytra*: epipleural flange in about 50 per cent of all females; expansion starting at about midbody level, i.e., at the front of the position of the midlateral spot; apices slightly truncated. *Venter*: coxal file only weakly present in males; ridges counted with difficulty (about 25 to 30); prosternal process with well-defined crest; lobes of postcoxal processes rounded and laterally projecting well beyond the midline; male right posterior margin of fifth abdominal segment with slight protuberance; last ventral abdominal segment of male slightly truncated, produced with rugae along the posterior margin; margin of female last ventral segment weakly sinuate on either side and with a distinct groove forming a marginate edge; midline crest well-developed with a nearly acute

Table 9. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus fuscipennis*.

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Veracruz	♂	45	4.45	0.163	3.55	0.120	(30)	2.50	0.079	1.96	0.060	0.554	0.0028
	♀	60	4.44	0.161	3.51	0.119	(57)	2.53	0.109	1.96	0.076	0.558	0.0026
Nayarit	♂	7	4.47	0.201	3.47	0.194	(4)	2.50	0.120	1.95	0.116	0.562	0.0165
	♀	5	4.47	0.070	3.45	0.070	(4)	2.52	0.052	1.97	0.029	0.571	0.0130
Mazatlan	♂	20	4.55	0.123	3.59	0.103	....	2.59	0.074	2.01	0.064	0.560	0.0053
	♀	30	4.41	0.185	3.47	0.150	(27)	2.49	0.116	1.95	0.137	0.562	0.0096

peak at apex; a few rugae near apex and at middle of each side. *Legs*: male pro- and mesotarsi noticeably enlarged in dorsoventral plane; palettes large enough to be easily distinguished at 20 power magnification, fifth tarsal segment on both pair of legs about one and four-fifths as long as corresponding fourth; 5 to 6 setae on both pro- and mesofemoral margins. *Genitalia*: oval plate large, with sharp, but not acuminate tip and numerous (20 to 25) raised lines, but with weak crest apparent only near apex; crest and lines all strongly curved to the left; aedeagus with distinctive apical cuneiform projection, bent with groove on one side; right paramere elongated with produced apex; left paramere with rather broad rounded base; ovipositor with about 12 sawlike teeth.

NOMENCLATURAL NOTES. — There appears to be no synonymy in this species, even though Sharp described it from just two females and it has a fairly wide distribution over Mexico. The type locality is Oaxaca, Mexico. I have not been able to collect this species from near Oaxaca City, but I have taken it at a lower elevation on the Isthmus of Tehuantepec. Apparently, some males from other species were placed with the two females in the collection of the British Museum (Natural History); but Sharp clearly marked a type. I have seen the cotype, which appears to be practically identical with the type, and have compared the cotype with numerous other specimens.

VARIATION. — Some individuals have less uniform irroration than others, with darker pigment accumulating in the posterior half of the elytra in a manner suggestive of *salvini* or *mexicanus*; but the variation does not seem to have a geographical basis.

Females from the west coast generally have smaller epipleural flanges than do those from Veracruz. The incidence of females with flanges is just as high, however.

The sexes are about the same size. The peaks in length frequency distributions are at the same measurement — about 4.75 mm. The overlap is nearly complete, but the largest individuals were males and the smallest ones were females. Populations from both coasts agree closely in quantitative characters and give no indication of any racial difference (Fig. 16).

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This is a Mexican species that occurs commonly on the coastal lowlands and rarely at higher elevations. It has been taken from all across the Isthmus and northwestern Chiapas to San Luis Potosi and on the west coast from the southern coast of Jalisco to Mazatlan. There is a large gap between east and west coast populations, undoubtedly due to a lack of collections. It occurs mainly in temporary

situations in clay soils. I have collected it most frequently in roadside ditches and cattle ponds that have little vegetation and few rocks or gravel. It is clearly a tropical species that has its northern limits restricted by freezing temperature (Fig. 12).

MATERIAL EXAMINED

MEXICO. — **CHIAPAS.** Near Pichucalco, 1 ♂, 1 ♀, xii.26.63, JRZ (NMSU). **CHIHUAHUA.** Hidalgo del Parral, 1 ♀, xii.9.62, JRZ (NMSU). **JALISCO.** Barra de Navidad, 1 ♂, x.25.66; La Huerta, 5m. N., 1 ♂, x.25.66, A. H. Smith & JRZ; Mezquitan, 3 ♂, 1 ♀, iii.28.64, JRZ (NMSU). **MORELOS.** Cuernavaca, 1 ♀, viii.—.55, L. H. Krauss (CAS). **NAYARIT.** Acaponeta, 8 m. NW., Rio de las Canyas, 6 ♂, 2 ♀, xi.25.48, H. B. Leech (CAS); 12 m. S., 1 ♀, vii.31.62, JRZ (NMSU). Pena, 12 m. N., 1 ♂, 3 ♀, xi.26.48, H. B. Leech (CAS). San Blas, 5 m. E., 3 ♂, 1 ♀, vii.31.62, JRZ (NMSU). Tepic, 18 m. NW., 1 ♂, xi.27.48, H. B. Leech (CAS). **OAXACA.** Matias Romero, 2 ♀, ix.9.64; Juchitan, 20 km. N., 1 ♂, 1 ♀, ix.7.64, JRZ (NMSU). **PUEBLA.** Near Maria Andrea, 12 ♂, 19 ♀, ix.10.64, JRZ (NMSU). **SAN LUIS POTOSI.** Comoca, Rio Axtla, Rd. 85, 7 ♂, 4 ♀, iii.23.63, JRZ (NMSU). Cuidad del Maiz, 1 ♀, xi.19.48, H. B. Leech (CAS). **SINALOA.** Concordia, 8 m. E., 2 ♂, 1 ♀, xii.12.62; Mazatlan, 16 ♂, 15 ♀, xii.11.62; 7 m. S., 7 ♂, 16 ♀, xii.11.62, JRZ (NMSU). **VERACRUZ.** Acayucan, 20 m. S., 10 ♂, 11 ♀, ix.7.64; Catemaco, 1 ♂, 1 ♀, viii.26.62, JRZ (NMSU). Cuitlahuac, 20 ♂, 20 ♀, viii.10-12.64, P. J. Spangler (USNM). Huatusco, 25 km. E., 1 ♂, 3 ♀, ix.9.64, JRZ (NMSU). Near Garro, 13 ♂, 10 ♀, ix.8.64; J. D. Covarrubia, 1 ♂, 4 ♀, viii.26.62; Martinez de la Torre, 5 km. E., 5 ♂, 9 ♀, ix.9.64; near La Tinaja, 2 ♂, 1 ♀, viii.25.62; Papantla, 18 km. E., 2 ♂, 1 ♀, ix.9.64; Paso del Toro, 15 km. W., 1 ♂, 1 ♀, ix.8.64, JRZ (NMSU). Poza Rica, 9 m. W., 2 ♂, 1 ♀, viii.27.65, P. J. Spangler (USNM). Puenta Jula, 1 ♂, 2 ♀, xii.18.48, H. B. Leech (CAS). Santiago Tuxtla, 10 km. S., 2 ♂, 2 ♀, ix.8.64, JRZ (NMSU).

Laccophilus youngi, new species (Figs. 114-121, 305)

DIAGNOSIS. — The unique combination of a non-irrorated, variegated, or marmorated elytral pattern, metacoxal file in the male, intermediate prosternal process, and size makes this one of the most distinctive species in North America. Only *L. pictus* and *L. gentilis suavis* are not irrorated and possess files; but the first has a black and yellow pattern, and the second is a much smaller species with a subbasal fascia. In a total of 50 females an epipleural flange was always present. Other *Laccophilus* that possess the character that frequently are all irrorated — *L. maculosus shermani, L. fuscipennis,* and *L. vacaensis chihuahuae. L. quadrilineatus* and *L. raitti* have variegated or marmorated patterns; but files are lacking, and the females have rakelike instead of sawlike ovipositors.

DESCRIPTION. — Medium to large (length, 4.6 to 5.4 mm; width, 2.7 to

Table 10. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus youngi*.

Locality		N	length		elytral length		width		pronotal width		PW/EL	t_{95}
La Huerta,	♂	16	5.09	0.105	4.13	0.089	2.99	0.076	2.30	0.054	0.557	0.0034
Jalisco	♀	29	4.93	0.141	4.00	0.102	2.92	0.092	2.23	0.069	0.557	0.0027
Autlan,	♂	3	5.17	.....	4.19	.....	.....	.....	2.29	.....	0.545	.....
Jalisco	♀	9	4.93	0.111	4.03	.....	.....	.....	2.20	0.057	0.551	0.0077

3.0 mm), variegated, light and dark brown species; coxal file present; prosternal process intermediate; ovipositor sawlike. COLOR. *Head*: pale brownish-yellow above and beneath except for reddish-brown occiput; appendages pale except mandibles. *Pronotum*: mostly pale brownish-yellow, but with large dark reddish-brown to nearly black blotches on the anterior margin between the eyes and continuous with the occipital dark area; posterior margin translucent brownish-red. *Elytra*: large dark brown or nearly black blotch over most of the disc on a pale brownish-yellow background; pattern tending to be marmorated with anterior and posterior extensions from the central blotch; epipleura generally pale except for the light reddish-brown translucence in posterior half. *Tergite VIII*: pale yellowish-brown. *Venter*: generally light yellowish-brown with slightly darker reddish-brown tinges at coxal bases and on the hind legs. *Genitalia*: variably reddish-yellow brown. ANATOMY. *Microreticulation*: double on head, pronotum, and obviously so on elytra. *Head*: supraclypeal seam diverging upward at midline instead of remaining parallel to margin. *Pronotum*: epipleural flange nearly always present on females; apical truncation slight in females; not clearly distinguishable in males. *Elytra*: WH/PW, 0.68; LP/PW, 0.41. *Venter*: coxal file prominent in males, composed of about 19 coarse lines; prosternal process intermediate with apex reaching almost to a line drawn even with the posterior margins of the mesocoxal cavities and with a sharply defined crest on apical expanded portion; lobes of postcoxal process rounded, projecting laterally well beyond the midline; last visible abdominal segment of male evenly rounded, with numerous prominent rugae and a weakly defined, nearly symmetrical ventral crest; scattered setigerous punctures and a few thick, short hairs at ventral lateral margin; female with the apex tending to be triangular in outline and with a groove or impressed line forming a margin on either side of the apex; rugae, setigerous punctures and hairs as in male. *Legs*: pro- and mesotarsi enlarged in a dorsoventral plane; fifth tarsal segments about one and one-half to one and two-thirds as long as corresponding fourth; profemoral setae (7) about half as long as mesofemoral (7 to 9) ones; longer metatibial bifid spine nearly as long as first two metatarsal segments. *Genitalia*: oval plate produced to point; its ventral crest apparent near tip, numerous weak lines on either side of crest and diverging away from midline; aedeagus widened at about three-quarters its length, then narrowing to a blunt tip; ovipositor with about 13 pair of sawlike teeth.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *Laccophilus youngi* occurs on the western side of the continent from Nayarit to Guatemala (Fig. 23). There is also a single male from Poza Rica, Veracruz. It is found in tropical deciduous forest at about 2000 to 3000 feet, and I have collected it almost entirely in deeply cut mountain valley streams with strong current. This probably accounts for its rarity in collections since most *Laccophilus* avoid strong currents. It is also one of the few species that occurs

where there is a heavy shaded canopy over the stream. It uses grassy margined and gravelly bottomed, silted streams — as well as those with solid rock bottoms. They apparently can make use of any kind of debris to maintain their position in the stream.

MATERIAL EXAMINED

Holotype male, *allotype*, and four male and four female paratypes with the following data are in the United States National Museum: 3 miles north of La Resolana (Casimiro Castillo), x.26.66, A. H. Smith and J. R. Zimmerman. Other paratypes distributed as follows: three males and nine females, 29 miles northeast of Colima, Colima (in Jalisco), xii.3.48, H. B. Leech, and two males and one female, Sierra de Zapotan, xi.—.42, Eugenio Paredes, are in the California Academy of Science, San Francisco, and a male and female, same data, in the University of Michigan, Museum of Zoology, Ann Arbor; and one male and one female with the same data as the holotype, Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico.

MEXICO. — **CHIAPAS.** Arriaga, 1 ♀, vii.22.65, P. J. Spangler (USNM). Cuahtemoc, 1 ♂, 1 ♀, viii.30.63, JRZ (NMSU). **COLIMA.** Trapechi, 1 ♀, vii.29.62, JRZ (NMSU). **JALISCO.** Autlan, 9 m. SW., 4 ♂, 7 ♀, x.24.66, A. H. Smith & JRZ (NMSU). Colima, 29 m. NE. (given as state of Colima, but this would have to be Jalisco), 3 ♂, 9 ♀, xii.3.48, H. B. Leech (CAS). La Huerta, 5 m. N., 3 ♀, 6 m. N., 1 ♂, 6 ♀, x.25.66; 22 m. N., 12 ♂, 14 ♀, x.26.66, A. H. Smith & JRZ (NMSU). **NAYARIT.** Sierra de Zapotan, 3 ♂, 2 ♀, xi.—.42, Eugenio Paredes (CAS). **OAXACA.** Tapanatepec, 2 ♂, ix.1.63, JRZ (NMSU). **VERACRUZ.** Poza Rica, 1 ♂, viii.27.65, P. J. Spangler (USNM).

GUATEMALA. — Quiroga, 1 ♀, viii.14.65, P. J. Spangler (USNM).

LACCOPHILUS PICTUS

This polytypic species is composed of three races which have ranges that extend from the southwestern United States to Guatemala. Each race has been considered a separate species. *L. pictus* Castelnau was described in 1834 from Mexico, *L. insignis* Sharp in 1882 from Texas, and *L. coccinelloides* Régimbart in 1889 from Arizona. Intergrade populations have been found between *pictus* and *insignis* in Veracruz and between *pictus* and *coccinelloides* in Jalisco. Intergradation is restricted to two very small areas.

Although *L. pictus* males possess metacoxal files, the species appears to be rather far removed from other North American species with files. The bright yellow and black elytral pattern contrasts sharply with the dull irrorated brown or dark brown found in most of the others. Other differences are the strongly double microreticulation

Table 11. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus pictus*.

Laccophilus p. pictus

Locality		N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
Nicaragua	♂	39	4.58 0.146	3.52 0.113	(11)	2.70 0.087	2.14 0.079	0.608	0.0068
	♀	13	4.83 0.136	3.78 0.100	(11)	2.87 0.074	2.26 0.077	0.598	0.0077
Honduras	♂	39	4.58 0.146	3.56 0.126	(24)	2.74 0.083	2.16 0.074	0.607	0.0085
	♀	38	4.83 0.160	3.80 0.121	(30)	2.89 0.112	2.27 0.077	0.597	0.0073
Guatemala	♂	6	4.66 0.100	3.57 0.093	....	2.75 0.063	2.20 0.056	0.617	0.0136
	♀	8	4.82 0.187	3.79 0.155	....	2.84 0.110	2.25 0.104	0.594	0.0113
Tuxtla Gutierrez, Chiapas	♂	12	4.63 0.163	3.56 0.120	....	2.74 0.106	2.15 0.086	0.605	0.0066
	♀	11	4.82 0.278	3.70 0.199	....	2.85 0.177	2.22 0.125	0.600	0.0074
El Cameron, Oaxaca	♂	70	4.59 0.151	3.54 0.114	(65)	2.71 0.090	2.14 0.076	0.605	0.0028
	♀	77	4.88 0.147	3.80 0.123	(73)	2.89 0.098	2.26 0.103	0.595	0.0023
Tehuitzingo, Puebla	♂	15	4.56 0.154	3.54 0.150	....	2.70 0.106	2.14 0.073	0.605	0.0085
	♀	17	4.92 0.157	3.83 0.125	....	2.93 0.113	2.29 0.080	0.597	0.0044
Tonatico, Mexico	♂	12	4.62 0.121	3.52 0.084	(11)	2.74 0.179	2.13 0.063	0.604	0.0064
	♀	7	4.89 0.149	3.76 0.114	(5)	2.83 0.101	2.24 0.075	0.594	0.0114
La Tinaja, Veracruz	♂	21	4.74 0.103	3.68 0.101	....	2.83 0.072	2.22 0.055	0.602	0.0042
	♀	20	4.93 0.140	3.84 0.108	....	2.95 0.113	2.29 0.078	0.595	0.0040
Colima, Colima	♂	33	4.62 0.172	3.56 0.136	....	2.73 0.126	2.14 0.085	0.603	0.0036
	♀	39	4.88 0.156	3.80 0.119	....	2.90 0.113	2.26 0.079	0.596	0.0030
La Huerta, Jalisco	♂	100	4.58 0.148	3.52 0.114	....	2.68 0.090	2.10 0.069	0.597	0.0018
	♀	116	4.82 0.191	3.74 0.153	....	2.84 0.131	2.20 0.101	0.590	0.0017
Autlan, Jalisco	♂	62	4.70 0.121	3.63 0.099	....	2.79 0.074	2.19 0.059	0.601	0.0026
	♀	41	5.01 0.149	3.91 0.109	....	2.96 0.086	2.31 0.074	0.591	0.0034

Table 11 (*continued*)

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
					L. p. pictus × *L. p. coccinelloides*								
Union de Tula,	♂	17	4.77	0.122	3.66	0.091	....	2.82	0.067	2.21	0.051	0.603	0.0045
Autlan, Jalisco	♀	34	5.00	0.124	3.90	0.101	....	2.96	0.079	2.32	0.057	0.595	0.0037
					Laccophilus p. coccinelloides								
Guadalajara,	♂	51	4.65	0.186	3.56	0.150	....	2.69	0.118	2.13	0.085	0.597	0.0028
Jalisco	♀	33	4.97	0.180	3.83	0.147	....	2.88	0.115	2.26	0.089	0.591	0.0028
Tepic, Nayarit	♂	12	4.58	0.138	3.56	0.118	(11)	2.71	0.080	2.14	0.078	0.602	0.0065
	♀	17	4.84	0.163	3.78	0.136	(16)	2.86	0.107	2.26	0.071	0.599	0.0046
Aribaba, Sonora	♂	28	4.59	0.121	3.50	0.093	(26)	2.67	0.075	2.08	0.055	0.595	0.0042
	♀	65	4.81	0.137	3.73	0.111	....	2.80	0.087	2.21	0.063	0.592	0.0023
Pima and	♂	40	4.64	0.153	3.53	0.135	(37)	2.69	0.099	2.14	0.081	0.606	0.0038
Santa Cruz Cos., Arizona	♀	62	4.95	0.150	3.81	0.122	(61)	2.88	0.095	2.29	0.073	0.600	0.0034
J. Davis Co.,	♂	26	4.79	0.150	3.67	0.132	(24)	2.77	0.085	2.21	0.060	0.603	0.0051
Texas	♀	47	5.06	0.163	3.90	0.120	(45)	2.94	0.104	2.32	0.079	0.595	0.0035
Sierra Juarez,	♂	11	4.68	0.096	3.57	0.159	(5)	2.80	0.045	2.15	0.086	0.603	0.0076
Baja California	♀	14	5.05	0.193	3.84	0.075	....	2.95	0.093	2.30	0.072	0.600	0.0076
Cape Region,	♂	54	4.80	0.115	3.65	0.094	(22)	2.84	0.058	2.23	0.071	0.603	0.0043
Baja California	♀	77	5.04	0.145	3.88	0.118	(50)	2.99	0.131	2.34	0.080	0.606	0.0038
					Laccophilus p. insignis								
Blanco Co.,	♂	53	5.52	0.210	4.27	0.135	....	3.22	0.116	2.55	0.096	0.598	0.0031
Texas	♀	52	5.43	0.207	4.26	0.153	(48)	3.19	0.123	2.51	0.099	0.589	0.0029

Table 11 (*continued*)

Laccophilus p. insignis

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Cuidad Mante,	♂	14	5.53	0.250	4.31	0.192	....	3.21	0.157	2.54	0.108	0.589	0.0068
Tamaulipas	♀	28	5.43	0.188	4.27	0.153	....	3.18	0.124	2.48	0.196	0.581	0.0037
El Salto,	♂	11	5.57	0.125	4.36	0.102	....	3.25	0.099	2.56	0.069	0.588	0.0051
San Luis Potosi	♀	26	5.51	0.195	4.33	0.157	....	3.23	0.124	2.51	0.097	0.581	0.0041
Tamazunchale,	♂	11	5.70	0.067	4.45	0.084	....	3.32	0.069	2.61	0.048	0.587	0.0044
San Luis Potosi	♀	12	5.63	0.195	4.40	0.150	....	3.30	0.129	2.57	0.093	0.583	0.0040
Maria Andrea,	♂	4	5.65	0.111	4.39	0.102	....	3.29	0.034	2.59	0.038	0.590	0.0099
Puebla	♀	3	5.47	.....	4.30	.....	....	3.18	.....	2.52	.....	0.586	.....
L. p. pictus × *L. p. insignis*													
Papantla,	♂	37	5.54	0.158	4.35	0.128	(36)	3.21	0.124	2.55	0.087	0.587	0.0031
Veracruz	♀	29	5.52	0.174	4.35	0.144	....	3.32	0.106	2.53	0.080	0.581	0.0022

and the long pronotal apex. The relative length of the pronotum exceeds any other North American *Laccophilus*.

DESCRIPTION. — Medium to large (length, 4.2 to 5.9 mm; width, 2.5 to 3.4 mm), black and yellow species; metacoxal file present; prosternal process short; ovipositor sawlike. COLOR. *Head*: pale brownish-yellow in front; occiput, inner eye margin and mandibular margins black; other appendages yellow. *Pronotum*: disc to lateral margins pale brownish-yellow, but entire anterior and posterior margins black filling in the entire "V" at the apex. *Elytra*: strikingly marked with yellow and black; epipleura black or dark reddish-brown. *Tergite VIII*: pale yellow-brown tinged with red. *Venter*: entirely pale in shades of brownish-yellow variably tinged with red. *Genitalia*: same as venter. ANATOMY. *Microreticulation*: strongly double on head, pronotum and elytra; individual cellules often not visible; pronotum roughened. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: relatively longer from head to apex due to the more acute angle formed by the adjacent margins of the pronotum and elytra; WH/PW, 0.67; LP/PW, 0.44-0.46. *Elytra*: epipleural flange common in *insignis*, but rare in the other two races; truncation of apices marked. *Venter*: coxal file prominent in males and weakly present in females, composed of about 25 relatively coarse lines, and about 8 to 10 much finer ones; prosternal process with well-defined crest in apical half; lobes of postcoxal processes rounded and laterally projecting well posterior to midline; last visible ventral abdominal segments not truncated (discussed under subspecies). *Legs*: male pro- and mesotarsi noticeably enlarged in a dorsoventral plane; first three segments with lateral distal corners produced; palettes large enough to be easily distinguished at 20 power magnification; fifth tarsal segments on front and middle legs about one and two-thirds as long as corresponding fourth; mesofemoral setae (6 to 8) about twice as long as profemoral ones (6 to 7). *Genitalia*: oval plate with produced acuminate tip and with prominent ventral crest extending anteriorly and bending slightly to the left; numerous raised lines on either side of the crest, but longer and more numerous on the right; right paramere less triangular than in *maculosus* (fig. 129) and nearly as long as left; aedeagus narrowing abruptly near the tip; ovipositor with about 12 sawlike teeth.

Laccophilus pictus pictus Laporte de Castelnau, new status
(Figs. 122-124, 126, 127, 130, 133, 138, 301)

Laccophilus pictus Castelnau, 1835, p. 104. *Type*: unknown, Mexico. Aubé, 1838, p. 441; Horn, 1871, p. 330; Crotch, 1873, p. 400; Sharp, 1882a, p. 290; Sharp, 1882b, p. 11; Horn, 1883, pp. 277, 283; Leng, 1920, p. 77; Zimmermann, 1920, p. 23; Blackwelder, 1944.

DIAGNOSIS. — The combination of an elytral pattern with bright yellow spots on a black background, dark epipleura, and male metacoxal file separates *pictus* from all other North American species. The principal difference between *p. pictus* and *p. coccinelloides* is that the former has less yellow on the elytra;

L. p. insignis has the yellow spots expanded and fused into zig-zag fascia. *L. horni* has a black and yellow elytral pattern, but the epipleura are pale and the file is absent.

NOMENCLATURAL NOTES. — There has been some confusion in the discussion of the subspecies of *pictus*; but fortunately there have been no synonymical complications and no problems related to other species. The identity of *p. pictus* itself is not certain, however, since the type appears lost; and the type locality was given only as Mexico, and all three races occur there. I have not designated a neotype because I have not, as yet, visited the European museums where the type might be deposited. The type locality is being restricted, however, to El Cameron, Oaxaca.

VARIATION. — The races of *pictus* are probably the most strikingly patterned North American *Laccophilus*. The strongly contrasting and well-defined areas of yellow and black on the elytra permit easy and concise comparisons between individuals and populations. There is some individual variation in the size of the discrete spots and the degree to which other parts of the pattern are interconnected. There is a tendency for the second and fourth spots along the sutural midline to be smaller or absent in *p. pictus*. There is no apparent sexual difference in the elytral pattern.

Females are larger than males (Table 10, Fig. 14). The difference in mean size is more than 0.25 mm. The largest male from a sample of 317 specimens is 5.08 mm long, and the largest female in a sample of 371 specimens is 5.24 mm long. Populations from Jalisco to Honduras are remarkably similar in overall length. Plots of the frequency distributions for length result in smooth curves for males and females.

A sample taken about ten miles inland from Autlan, Jalisco, showed all degrees of intermediacy between *pictus* and *coccinelloides*. But at Autlan only the *pictus* elytral pattern and aedeagus are present in the population. Size, however, approaches the values for *coccinelloides*, indicating there is some introgression that is not apparent from analysis of elytral pattern or male genitalia. The average sizes for *pictus* is 4.60 mm for males and 4.87 for females; but the means for the Autlan sample is 4.70 for males and 5.01 for females, which is closer to *coccinelloides* and is larger than any other samples of *pic-*

tus except for those that might be influenced by *insignis* in Veracruz.

The PW/EL values which range from 0.590 to 0.617 are as high as those for *L. maculosus*. The means for males are higher in every sample, indicating a slight difference in body proportions. In both sexes, however, the length is 1.69 times the width, which means the shape of the pronotum may be relatively shorter in males. Another answer is that the greater curved surface of the larger females is creating a parallax error in measurement of the elytral length.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. p. pictus* ranges from Jalisco to central Veracruz and south to Honduras. It intergrades with *coccinelloides* between Autlan and Guadalajara in Jalisco and with *insignis* near Papantla, Veracruz (Fig. 13). It is most commonly found at elevations between 1000 and 4000 feet in arid tropical scrub in small mountain streams and pools that have granitic gravel bottoms. The bright yellow and black elytral pattern may be some protection in the clear streams that have irregular sized grains on the bottom. It is rare on the coastal plain. It will sometimes be abundant in grassy, mud-bottomed temporary ponds or puddles during the rainy season.

MATERIAL EXAMINED

MEXICO. — **CHIAPAS.** Arriaga, 1 ♂, 1 ♀, vii.22.65, P. J. Spangler (USNM). Chiapa de Corzo, 1 ♂, ix.1.63; Cintalapa, 5 m. W., 1 ♂, 4 ♀, ix.1.63; Comitan, 1 ♂, vii.30.63; Cuahtemoc, 4 m. W., 1 ♂, viii.30.63; Ixtapa, 3 ♂, 2 ♀, viii.31.63; Ocozucuatla, 6 m. W., 1 ♂, 1 ♀, ix.1.63; Tuxtla Gutierrez, 5 ♂, 3 ♀, ix.1.63, JRZ (NMSU). Las Cruces, 5 m. S., 21 ♂, 28 ♀, viii.23.65, P. J. Spangler (USNM). **COLIMA.** Colima, 7 m. NE., 24 ♂, 28 ♀, xii.—.48, H. B. Leech (CAS). Manzanillo, 5 m. S., 1 ♂, 1 ♀, vii.29.62; Tecoman, 5 m. N., 1 ♀, vii.29.62; Trapechi, 9 ♂, 13 ♀, vii.29-30.62, JRZ (NMSU). **GUERRERO.** Mexcala, 1 ♀, i.8.56, E. C. Bay (CNL). Zumpango, 12 m. N., 12, i.8.56, J. C. Schaffner (ISU). **JALISCO.** Autlan, 62 ♂, 42 ♀, x.26.66; 9 m. SW., 25 ♂, 39 ♀, x.24.66; Barra de Navidad, 2 ♂, 5 ♀, x.25.66; La Huerta, 6 m. N., 25 ♂, 39 ♀, x.25.66; 5 m. N., 2 ♂, 4 ♀, x.25.66; 6 m. S., 39 ♂, 40 ♀, x.24.66; 9 m. S., 3 ♂, 3 ♀, x.25.66, A. H. Smith & JRZ (NMSU). Tecalitlan, 10 m. S., 4 ♀, iii.27.64, JRZ (NMSU). **MEXICO.** Tonatico, 13 ♂, 8 ♀, viii.29.62, JRZ (NMSU). **MICHOACAN.** Apatzingan, 1200 feet, 1 ♀, viii.11.41, H. Hoogstraal (CAS). Uruapan, 2 ♂, iii.26.64; Tzitzio, 3 m. S., 2 ♂, 1 ♀, vii.22.63; 1 ♂, vii.27.62, JRZ (NMSU). **OAXACA.** El Cameron, 27 ♂, 34 ♀, viii.27.63; 25 km. N., 16 ♂, 21 ♀, ix.6.64; El Coyula, 16 km. S., 7 ♂, 6 ♀, ix.6.64; Huajuapan, 2 km. S., 5 ♂, 5 ♀, ix.4.64; 17 km. NE., 1 ♂, ix.3.64; Juchitan, 20 km. N., 1 ♀, ix.7.64; Matias Romero, 5 m. S., 1 ♀, ix.7.64; Oaxaca, 2 ♂, 1 ♀, viii.25.63; Tehuantepec, 1 ♂, 2 ♀, ix.6.64; Texquisitlan (Rd. 190), 9 ♂, 7 ♀,

Figure 13. Distribution of *Laccophilus pictus.*

ix.6.64; Tlacolula, 1 ♂, ix.6.64, JRZ (NMSU). Amatitlan, 3 ♂, 9 ♀, xii.10.48, H. B. Leech (CAS). **PUEBLA.** Puebla, 2 ♂, 1 ♀, vi.26.57, D. R. Lauck (USNM). Tehuitzingo, 15 ♂, 17 ♀, viii.24.63, JRZ (NMSU). **VERACRUZ.** Cuitlahuac, 9 ♂, 11 ♀, viii.25.62; Huatusco, 25 km. S., 7 ♂, 1 ♀, ix.9.64; La Tinaja, 4 ♂, 2 ♀, viii.25.62, JRZ (NMSU). Paso del Macho, 25 km. NE., Cordoba, 1 ♂ (from B.C.A.), Hoege, donated by F. DuGodman, 1907 (AMNH); 2 ♂ (same locality data), (ANSP). Paso de Ovejas, 2 ♂, 6 ♀, viii.27.62, JRZ (NMSU).

EL SALVADOR. — Usulutan, 5 m. E., 1 ♀, vii.31.65, P. J. Spangler (USNM).

GUATEMALA. — Aldea Jesus Maria, 4 ♂, 8 ♀, viii.15.65; El Progreso, 5 m. S., 1 ♂, 5 ♀, viii.11.65; Pijije, 1 ♂, vii.8.65, P. J. Spangler (USNM).

HONDURAS. — Choluteca, 10 m. W., 1 ♀, vii.29.65; Jicaro Galan Jct., 2 ♀, vii.29.65; Pespire, 12 ♂, 15 ♀, vii.29.65; Sabarra Grande, 10 m. N., 1 ♂, vii.29.65; San Marcus Colon, 39 ♂, 29 ♀, vii.25.65, P. J. Spangler (USNM).

NICARAGUA. — Esteli, 9 m. N., 4 ♂, 4 ♀, vii.10.65; San Benito, 13 m. N., 1 ♀, vii.11.65; Somoto, 6 ♂, 5 ♀, vii.10.65; 4 m. W., 6 ♂, 5 ♀, vii.10.65, P. J. Spangler (USNM). Musawas, 1 ♂, xi.1.55, B. Malkin (CAS).

Laccophilus pictus coccinelloides Régimbart, new status
(Figs. 130, 132, 136, 300)

Laccophilus coccinelloides Régimbart, 1889, p. 112. *Type*: Leyden Museum, Arizona. Leng, 1920, p. 77; Zimmermann, 1920, p. 17.
Laccophilus pictus Leech, 1948, p. 400.

DIAGNOSIS. — The same combination of characters for *p. pictus* applies for *p. coccinelloides*; the principal differences are in the structure of the male aedeagi and in the presence of four larger yellow spots near the elytral midline of the latter.

NOMENCLATURAL NOTES. — The identity of Régimbart's *coccinelloides* (unlike Castelnau's *pictus*) is certain since Arizona was given as the type locality. The race from southern Mexico and Central America was retained as typical *pictus*. Also, there can be no confusion of *insignis* and *coccinelloides* since the former occurs no farther west than Texas. Horn (1883) and Leech (1948b) used *pictus* for the populations in Baja California, but *coccinelloides* is the race that occurs there.

VARIATION. — There is no marked sexual difference in pattern and no recognizable trend in the pattern variation, but females average more than a 0.25 mm larger than males (Table 11, fig. 14). There is also no clear geographic size variation. The two largest groups are females from the cape region of Baja California and from the Davis Mountains of Texas (Table 10), and the smallest males

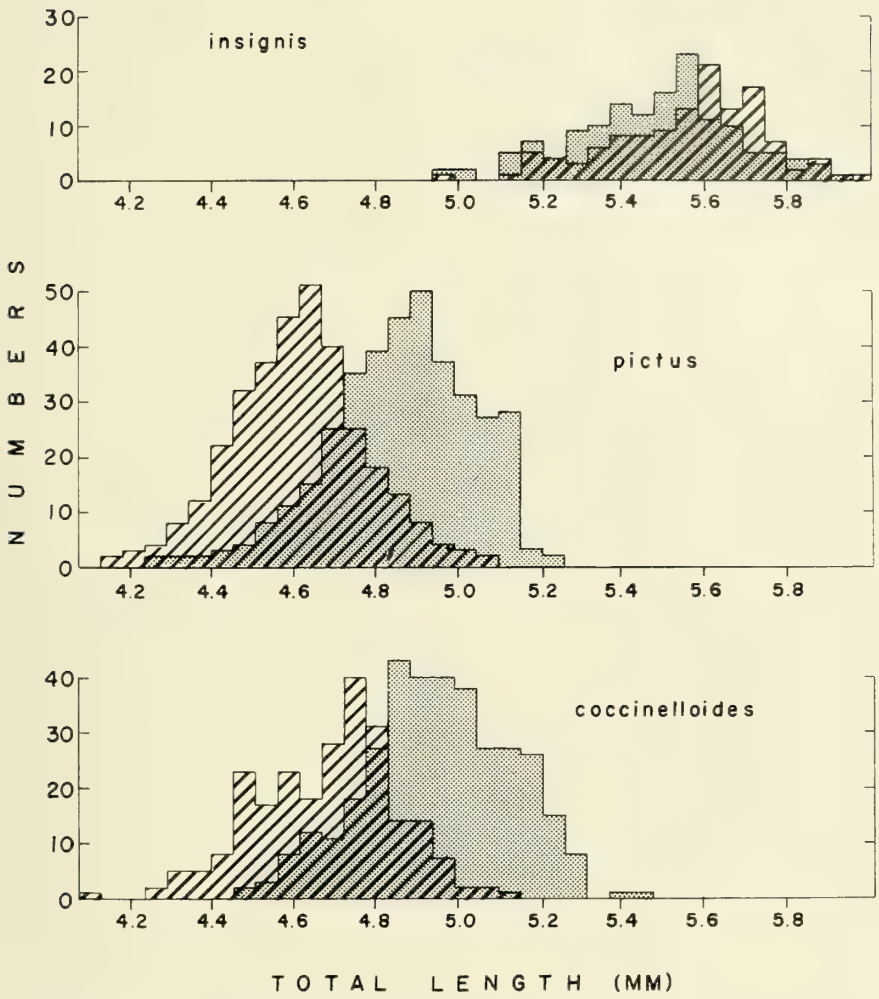

Figure 14. Histograms of length in *Laccophilus pictus*. Males are shown crosshatched; females, stippled.

come from northeastern Sonora and from Nayarit. Plots of the frequency distribution of total length suggest, however, that there is some unanalyzed heterogeneity in the samples. The peak occurs about 4.8 mm, but the mean is 4.68 mm; and the slope is irregular, with the suggestion of another peak at less than 4.6 mm. This curve contrasts with the smooth one obtained for *pictus*. To some extent, the samples from Baja California and the Davis Mountains of Texas are isolated

from the rest of the subspecies; and it might be that, with sufficient material, they would prove to be statistically different populations, contributing to the irregularity of the frequency distribution curve.

L. p. coccinelloides appears to be slightly larger than *p. pictus* and smaller than *p. insignis*. The sample from near Union de Tula has the size of *coccinelloides,* but the elytral pattern and aedeagus show all degrees of intermediacy. The WP/EL ratio is the same for both races.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This race occurs from central Arizona to central Jalisco and to the extreme southern end of Baja California (fig. 13). It is also common in the extreme southwestern county (Hidalgo) of New Mexico and in west Texas in the Guadalupe, Davis, and Chisos Mountains. It should occur in southern California. While it is more characteristic of the west slope of the Sierra Madre Occidental, it is easy to find on the Plateau in Chihuahua and Durango. It and *pictus* occur mostly at 1000 to 4000 feet, but can be found below and above those limits. Its usual habitat is in pools of gravelly bottomed mountain streams in the pine-oak woodland vegetation zone.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ARIZONA.** *Cochise County.* Douglas, 1 ♂, iii.15.33; 1 ♀, iv.2.33, W. W. Jones (BERK). Huachuca Mtns., 21, v.7-8.53, A. H. Dietrich (CNL). Portal, 5 m. W. SWRS, 2 ♀, x.1.55, M. Cazier; 2 ♀, v.4.56, M. Statham (AMNH); Portal, 1 ♀, vi.4.59, L. A. Stange (DAV). *Navajo County.* Near Kayenta, Tsegi Can., 3 m. N., Marsh Pass, 1 ♂, ix.13.50, J. Figg-Hoblyn (CAS). *Pima County.* Baboquivari Mtns., Brown Can., 1, viii.8.53, D. Butler (ARI); Baboquivari Mtns., 3, —.—.23; 6, x.1-15.24, O. C. Poling (CNL); 2, viii.18.32, D. K. Duncan (CNL). Organ P. Cactus N.M., Ajo Mtns., Alamo Can., 1 ♂, xii.14.39, G. G. Habison (CAS). Santa Catalina Mtns., Bear Canyon, 9 ♂, 15 ♀, i.2.38, Van Dyke (CAS); 1 ♂, 2 ♀, iii.15.64, J. W. Green (CAS); 3, xi.10.36, L. P. Wehrle (ARI); 1 ♂, 3 ♀, ii.1.38, J. W. Tilden (FM); Molino Basin, 1 ♂, 1 ♀, vi.9.54, R. S. Beal (CAS); 1 ♂, 1 ♀, vi.9.54, R. S. Beal (BERK); 1 ♂, vi.11.58, C. D. & F. MacNeil (CAS); Lowell Rngr. Sta., 7, vii.6-20.16 (USNM); 11, vi.18.—, Hubbard & Schwarz (USNM); Sabino Canyon, 1, x.26.15, Dodge (USNM); 1 ♀, J. W. Tilden (FM); Santa Catalina Mtns., 1 ♀, v.8.33, O. Bryant (CAS); 2, x.6.42, E. Brainard (ARI). Tucson, 1 ♂, iv.10.38 (FM); 1 ♂, 5 ♀, iii.13.46, J. W. Green (DAV); 5 ♂, 11 ♀, i.27.35, O. Bryant (CAS); 3 ♀, ix.-x.—.28; 2 ♀, ix.—.28, F. H. Parker (CAS); 1 ♀, x.—.28, F. H. Parker (BERK); 2, iii.13.36, L. P. Wehrle (CNL); Sabino Canyon, 6, iii.13.36, J. G. Needham (CNL); 1, iii.21.53, A. & H. Dietrich (CNL); Tucson, 15 m. NE., 2 ♂, 3 ♀, x.5.63,

K. L. McWilliams (NMSU). *Pinal County*. Oracle, 14 m. E., 3 ♂, 2 ♀, vii.27.24, J. O. Martin (CAS). *Santa Cruz County*. Atasco Mtn., 1, vii.27.54, D. Butler (ARI); Coronado N.F., Pena Blanca L., 4 ♂, ix.6.61, JRZ (NMSU); Nogales, 1 ♂, 2 ♀, iv.—.97, Koebele; 3 ♂, 1 ♀, ix.3.06, 2 ♂, viii.31.06, F. W. Nunenmacher, 1 ♂, viii.19.06 (CAS); 1 ♂, ix.3.06 (FM); 1 ♀, ix.3.06, F. W. Nunenmacher (CAS); Pena Blanca, 1 ♀, vii.1.61, 2 ♂, vii.11.61; 1 ♀, vii.31.61; 1 ♀, viii.4.61; 1 ♀, viii.9.61; 1 ♂, 1 ♀, viii.11.61; 2 ♂, 9 ♀, viii.12.61; 4 ♀, ix.6.61; 1 ♂, 3 ♀, vi.28.62; 1 ♀, vii.12.62; 2 ♀, vii.14.62; 1 ♀, vii.24.62; 2 ♀, viii.8.62; 1 ♂, vii.12.63; 1 ♀, vii.23.64, R. H. Arnett & E. Van Tassel (CUA). Patagonia, 3 m. S., Sonoita Ck., 2 ♂, 3 ♀, ix.6.61, JRZ (NMSU). Sycamore Cn., Tumacacori Mt., 1,♂, 7 ♀, vii.27.65, H. B. Leech (CAS). Ruby, 2, xi.20.55, F. Werner & G. Butler (ARI). Santa Rita Mtns., Box Can., 2 ♂, viii.29.52, B. Malkin & V. Thatcher; Santa Rita Mtns., 1 ♀, x.21.34, O. Bryant (CAS); 1, xi.18.—, Hubbard & Schwarz (USNM). Tumacacori, Sycamore Can., 1, vi.3.53, A. & H. Dietrich (CNL). *Yavapai County*. Castle Hot Springs, 2 ♂, 2 ♀, iv.5.42 (AMNH). Bloody Basin (about 25 m. S. of Verde Hot Springs), 2 ♂, 7 ♀, vi.8.47, F. H. Parker (CAS). Prescott, 2 ♀, viii.—.— (AMNH). **NEW MEXICO.** *Hidalgo County*. Animas Mtns., Double Adobe Rnch., 1 ♀, viii.15.52, H. B. Leech (CAS). *Dona Ana County*. Las Cruces, Rio Grande R., 1 ♀ (NMSU). **TEXAS.** *Brewster County*. Alpine, 20 m. S., 1 ♂, v.12.17, J. O. Morton (CAS). Rio Grande(?), 5, vi.13-17.08, Mitchell & Cushman (USNM). Big Bend Ntl. Pk., Chisos Mtns., 1 ♀, vii.3.42, H. A. Scullen (ORES). *Culberson County*. Nickel Ck. Sta., 2.5 m. E., 1 ♂, ix.9.52, B. Malkin (CAS). *Davis County*. Davis Mtns., Elbow Canyon Ck., 6 ♂, 8 ♀, x.27.61, JRZ (NMSU). Limpia Canyon, 1, iv.19.53, B. Adelson & M. Washbauer (BERK); 17 ♂, 34 ♀, ix.4-5.52, B. Malkin (FM). Madera Canyon Ck., 1 ♂, viii.3.61; 1 ♀, x.27.61; Davis Mtns., tank, 1 ♂, x.27.61, JRZ (NMSU). Ft. Davis, 2 ♀, iv.19.53, Adelson & Washbauer (USNM); 1 ♀, viii.10.16 (MCHS); 1 m. N., 4, vii.16.41, B. E. White (CAS). Kent, 13 m. S., 1 ♂, 1 ♀, ix.8.52, B. Malkin (FM). Old Ft. Canon, 1, iii.8.36, J. G. Needham (CNL).

MEXICO. — **BAJA CALIFORNIA.** Aqua Caliente (Cape region), 9 ♂, 14 ♀, iv.22.47, I. LaRivers (BERK). Cabo San Lucas, 7.7 m. NE., 1 ♂, 1 ♀, i.6.59, H. B. Leech; El Triunfo, 7 ♂, 9 ♀, viii..13.38, Michelbacher & Ross; Miraflores, 3 m. NW., 1 ♀, i.19.59, H. B. Leech; La Parras, 1 ♂, x.23.—, W. M. Mann; La Suerte, 1 ♂, vi.4.63, R. K. Benjamin; La Paz, 12.4 m. E., 2 ♂, 2 ♀, xii.23.58, H. B. Leech; 18.5 m. S., 1 ♂, 1 ♀, xii.19.58, H. B. Leech (CAS). Padarone, 7 ♂, 6 ♀, v.11.47, Ira LaRivers; Todos Santos, 2 ♂, 1 ♀, iv.10.47, I. LaRivers; 1 ♀, iv.10.47, Ira LaRivers; San Bartolo, 6 ♂, 1 ♀, v.1.47, I. LaRivers (BERK). 1 m. SE., 1 ♀, i.20.59, H. B. Leech; San Antonio, 1 ♂, 1 ♀, vii.12-17.19, J. R. Slevin; 1 ♀, vii.12.19, G. F. Ferris; San Jose del Cabo, 1 ♂, 1 ♀ (CAS). San Luis Gonzaga, 12 m. E., 1 ♂, 2 ♀, v.22.47 (BERK). San Felipe, 2 ♂, G. W. Beyer (CAS); 8 ♂, 14 ♀, G. W. Beyer (AMNH). Santa Rosa, 1 ♂, 2 ♀, viii.-ix.—.01, G. Beyer (FM). Sierra Juarez, Guada-

lupe Cn., 1 ♂, 1 ♀, vii.6.55, R. Orr & C. Tese (CAS). **CHIHUAHUA.** Chihuahua, 43 m. N., 2 ♂, 1 ♀, xii.8.62, JRZ (NMSU). Chihuahua, 12 m. N., 1 ♀, viii.23.60, Arnaud, Ross, Rentz (CAS). Parral, 2 m. S., 3 ♂, 1 ♀, vii.25.62, JRZ (NMSU). **DURANGO.** Abasolo, Rio Nazas, 1 ♂, x.22.66, A. H. Smith & JRZ; La Zarca, 15 m. N., 1 ♂, vii.25.62; San Juan del Rio, 10 m. N., 1 ♂, 1 ♀, xii.9.62, JRZ (NMSU). **JALISCO.** Barranca Oblato, 8 m. NE. Guadalajara, 53 ♂, 34 ♀, A. H. Smith & JRZ; Guadalajara, 20 m. E., 1 ♀, iii.25.64, JRZ (NMSU). Tala, 4 ♂, 5 ♀, iii.25.64, JRZ; Tecolotlan, 1 ♂, x.24.66, A. H. Smith & JRZ (NMSU). Tlaquepaque, 2 ♀, vii.—.53, N. L. H. Krauss (CAS). **NAYARIT.** Tepic, 25 km. S., 3 ♂, 3 ♀, ix.24.53, B. Malkin; 24 m. SE., 1 ♂, 1 ♀, viii.16.60, Arnaud, Ross, Rentz; Ixtlan del Rio, 9 ♂, 14 ♀, ix.22.53, B. Malkin; San Blas, 1 ♀, ix.17-21.53, B. Malkin (CAS). **SINALOA.** Elota, 1 m. S., 1 ♂, 4 ♀, viii.1.62; Concordia, 8 m. E., Rd. 15, 1 ♀, xii.12.62; Mazatlan, 7 m. S., Rd. 15, 1 ♀, xii.11.62, JRZ (NMSU); 72 m. N., 1 ♂, i.—.62, Breedlove & Copp (CAS). **SONORA.** Alamos, 1 ♀, vii.30.40, R. P. Allen (CAS); 1 ♀, xi.1.60, R. L. Westcott (LACM); Aribabi (E. of Moctezuma), 30 ♂, 65 ♀, xii.15.62, JRZ (NMSU). 7 m. SE., 7 ♂, 6 ♀, viii.12.60, Arnaud, Ross, Rentz (CAS). Esqueda, 20 m. S., 2 ♀, vi.26.56, F. N. Young (FM); Guaymas, 1 ♂, ix.29.63, W. M. Mann (CAS). Nogales, 42 km. S., Rancho Atascosa, 1 ♂, 1 ♀, ix.21.52, B. Malkin (FM).

Laccophilus pictus insignis Sharp, new status
(Figs. 125, 128, 131, 134, 138, 302)

Laccophilus insignis Sharp, 1882a, p. 290. *Type*: male (?), British Museum (Natural History), Texas. Horn, 1883, p. 277; Zimmermann, 1910, p. 20; Leng, 1920, p. 77; Blackwelder, 1944, p. 74; Leech, 1948, p. 401.

DIAGNOSIS. — The black and yellow elytral pattern with a yellow zig-zag, subbasal band separates *insignis* from all other North American *Laccophilus*.

NOMENCLATURAL NOTES. — There has been some confusion of *insignis* with other races of *pictus,* but not with other species.

VARIATION. — Unlike *pictus* and *coccinelloides, insignis* females are smaller than males (Table 10, fig. 14). In all five locality samples the lengths of males exceeded that of females. The difference is about 0.07 mm. The WP/EL ratio appears to be slightly higher for males. The elytral pattern appears to be fairly uniform throughout the range, and there is no sexual difference. Intergrades between *pictus* and *insignis* from near Papantla, Veracruz, showed all degrees of pattern variation between typical *pictus* and *insignis,* but were close to the mean of *insignis* in size.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. p. insignis* ranges from west Texas to central Veracruz mainly on the eastern slope of the Sierra Madre Oriental (fig. 13). It is one

of the most common *Laccophilus* in the hill country of central Texas (Blanco County, for example). It is usually taken between 500 to 3000 feet in stream pools. It prefers granitic gravelly bottomed pools which frequently occur in oak woodland in the northern part of the range and in tropical deciduous or tropical evergreen forest in the southern part.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **KANSAS.** *Sedgwick County.* Derby, 1 ♀, vii.15.58, JRZ (NMSU). **OKLAHOMA.** *Greer County.* Mangum, 1, ix.9.— (USNM). **TEXAS.** *Blanco County.* Cypress Mill(s), 1, iv.2.—; 2, ix.10.88; Round Mountain, 1, —.—.26, H. S. Bolier; 1 (USNM); 2 ♂, 1 ♀ (ANSP); 5 ♂, 1 ♀ (MCZ). Shovel Mtn., vi.—.26; 1, —.—.29; 2 (USNM); 1 (CNL); 18 ♂, 27 ♀, ix.—.—, F. G. Schaupp (AMNH); 3 ♂ (MCZ). *Burnet County.* Marble Falls, 1, iii.14.59, E. O. Morrison (TAM). County, 2 (USNM). *Colorado County.* Columbus, 3 ♂, 4 ♀ (CARR). *Coryell County.* Fort Hood, 1, vi.5.55; 1, vii.19.55; 3, vii.30.55, Matthews (CNL). *Falls County.* Reagan (Wells?), 4, iii.6.36, J. G. Needham (CNL). *Gillespie County.* Fredericksburg, 5, vi.22.55, W. W. Boyle (CNL). *Hays County.* Dripping Springs, 3, viii.9.42, W. S. Ross & E. S. Ross (CAS). *Kendall County.* Comfort, 1 ♂ (CARR). *Kerr County.* Kerrville, 3, x.8.05; 5, vi.19.07, F. C. Pratt (USNM); 2, vi.21.42, E. S. Ross (CAS). *Llano County.* Llano, 2 ♂, 4 ♀, iv.25.63, George Child (NMSU). *Sutton County.* Sonora, Dry Devil's River, 5, xi.5.49, O. Bryant (CAS). *Travis County.* Austin, 3, vi.28.33; 5 (USNM). Lake Austin, 1 ♀, iv.3.53, J. E. Gillespie (AMNH). *Uvalde County.* Sabinal, 1, vi.19.10, F. C. Pratt (USNM). Uvalde, 3, v.21.33 (TAM). *Val Verde County.* Del Rio, 1 ♂, 1 ♀, vii.23.24 (MCZ). *Zapata County.* 1, ii.26.36, J. G. Needham (CNL). *Dubious record. El Paso County.* El Paso, 4 ♂, 5 ♀ (AMNH).

MEXICO. — **COAHUILA.** Ramos Arizpe, 1 ♂, 2 ♀, vii.7.63, JRZ (NMSU). **NUEVO LEON.** Allende, 1 ♂, vii.8.63, JRZ (NMSU). Sabinas Hidalgo, 1 ♂, xii.16.40, F. N. Young (AMNH). Sta. Catarina, Huasteca Can., 1 ♂, vii.7.63, JRZ (NMSU). **SAN LUIS POTOSI.** Agua Zarca (N. Platinito), 7 ♂, 3 ♀, iii.25.63; Antiguo Morelos, 3 ♀, iii.23.63, JRZ (NMSU). Cuidad del Maiz, 15 m. E., 1 ♀, xi.19.48, H. B. Leech. El Salto, 5 ♀, iii.25.63, Guaymuchil (N. Naranjo), 3 ♂, 11 ♀, iii.25.63; Jitalpa, 9 ♂, 5 ♀, iii.23.63, JRZ (NMSU). Palitla, 5 m. N. of Tamazunchale, 3 ♂, 8 ♀, xii.22.48, H. B. Leech. Valles, 29 m. N., 1 ♂, viii.19.54, F. N. Young (AMNH). **TAMAULIPAS.** Antiguo Morelos, 3 m. N., 1 ♂, 5 ♀, iii.26.63; 6 ♀, El Limon, 1 ♂, 2 ♀, iii.24.63; Llera, 1 ♂, 5 ♀, iii.23.63; Mante, 1 ♀, iii.23.63; Nuevo Morelos, 5 ♂, 9 ♀, iii.25.63; Ocampo, 6 ♂, 8 ♀, iii.24.63, JRZ (NMSU). San Jose, 2 ♂, iv.—.10 (USNM). Victoria, 3 ♂, 2 ♀, xii.10.—, F. C. Bishop (USNM).

L. p. pictus × *L. p. insignis*

VERACRUZ. Papantla, 18 km. E., 37 ♂, 31 ♀, ix.9.64, JRZ (NMSU).

LACCOPHILUS VACAENSIS

Laccophilus vacaensis Young is the most recently described *Laccophilus* in North America. It was described from a single locality on Key Vaca, Florida (1953). Specimens from other localities have long been present in the material from several museums; but due to its similar appearance in color, pattern, size, and shape to *L. proximus,* it was not recognized as distinct. It has a wide distribution and may be present in every one of the states along the southern tier of the United States, as well as occurring over much of Mexico and all the way to Costa Rica. It appears related to *L. tarsalis* Sharp, a South American species. There are three geographical races in North America. The most widely distributed is *v. vacaensis,* which has a perplexing distribution and may prove to be composed of more than one race when more is known about it. *L. v. chihuahuae* occurs from south-central Texas to southeastern Arizona. *L. v. thermophilus* is distributed around the Gulf of California. As yet, no intergrades are known between the races; but so few specimens have been taken from the possible intergrade areas that it cannot be concluded they do not intergrade. Apparently, all three races occur in southeastern Arizona; and it is possible that there is a circular overlap without intergradation in that region. This species appears to be most closely related to *L. spangleri* with which it must be considered sympatric in southern Mexico and Central America; but the collections are, unfortunately, so scattered that this is also an open question.

DESCRIPTION. — Medium (length, 4.0 to 5.3 mm; width, 2.2 to 3.0 mm), brown, irrorated species; metacoxal file absent; prosternal process short; fork-like ovipositor. COLOR. *Head*: generally pale brownish-yellow, but often with reddish tinge especially on the occiput between the eyes; appendages also yellow. *Pronotum*: generally the same as the head, but with darker brown areas of varying intensity at the anterior margin between the eyes and at the apex. *Elytra*: irrorated pattern variable and discussed under subspecies; epipleura pale anteriorly, but may darken posteriorly. *Tergite VIII*: pale yellowish-brown. *Venter*: variable from light brownish-yellow to light brown and light reddish-brown; metacoxal plates and hind legs usually darker than rest of venter. *Genitalia*: variable from light reddish-yellow brown to dark reddish-brown. ANATOMY. *Microreticulation*: faintly double on the vertex of the head but most cellules irregularly elongate; pronotum with some cellules double, but most single and irregularly elongate; single on elytral disc and more deeply impressed

Table 12. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus vacaensis*.

Locality		N	length		elytral length		width		pronotal width		PW/EL	t_{95}
Laccophilus v. vacaensis												
Brownsville, Texas	♂	5	4.80	0.130	3.77	0.168	2.66	0.089	2.13	0.061	0.565	0.0139
	♀	12	4.67	0.170	3.75	0.150	2.61	0.114	2.04	0.067	0.545	0.0054
Progreso, Yucatan	♂	49	4.60	0.111	3.68	0.099	2.62	0.074	2.09	0.053	0.568	0.0030
	♀	48	4.54	0.153	3.62	0.138	2.59	0.107	2.02	0.085	0.558	0.0028
Aldea, Guatemala	♂	6	4.89	0.094	3.89	0.081	2.73	0.043	2.17	0.037	0.558	0.0042
	♀	6	4.72	0.207	3.81	0.171	2.62	0.107	2.08	0.082	0.546	0.0084
Costa Rica	♂	24	4.94	0.153	3.96	0.126	2.71	0.103	2.22	0.079	0.561	0.0034
	♀	34	4.89	0.146	3.92	0.129	2.70	0.101	2.17	0.092	0.555	0.0091
Laccophilus v. chihuahuae												
Central, Texas	♂	2	4.05	.....	3.16	.....	2.16	.....	1.75	.....	0.566	.....
	♀	15	4.12	0.175	3.29	0.154	2.22	0.107	1.81	0.075	0.552	0.0073
Brewster Co., Texas	♂	4	4.29	0.101	3.38	0.051	2.33	0.034	.....	.....	.....	.....
	♀	7	4.18	0.164	3.32	0.120	2.21	0.110	1.77	0.055	0.534	0.0105
Hidalgo Co., New Mexico	♂	6	4.45	0.151	3.50	0.091	2.33	0.079	1.93	0.065	0.553	0.0066
	♀	8	4.50	0.113	3.56	0.156	2.39	0.122	1.91	0.098	0.537	0.0109
Cochise Co., Arizona	♂	2	4.45	.....	3.48	.....	2.40	.....	1.93	.....	0.554	.....
	♀	5	4.55	0.056	3.67	0.090	2.51	0.072	1.91	0.151	0.520	.....
Laccophilus v. thermophilus												
Northern Sonora	♂	2	4.48	.....	3.54	.....	2.44	.....	1.98	.....	0.557	.....
	♀	4	4.26	0.242	3.43	0.250	2.35	0.143	1.84	0.117	0.536	0.0346
La Paz, Baja California	♂	11	4.77	0.109	3.74	0.105	2.61	0.099	2.11	0.050	0.563	0.0062
	♀	7	4.56	0.143	3.58	0.066	2.47	0.088	2.00	0.084	0.557	0.0145

in females (pebbled). *Head*: supraclypeal seam arching slightly upward away from the margin. *Pronotum*: WH/PW, 0.66 to 0.67; LP/PW, 0.39 to 0.40. *Elytra*: slightly truncated; crease lying just above the female epipleuron and extending in a straight line posteriorly to just beyond half the length of the elytra; epipleura with prominent flanges in all females of *chihuahuae* and *thermophilus* but only rarely in *v. vacaensis*. *Venter*: prosternal process with well-defined median crest; postcoxal processes laterally projecting posterior to the midline; last abdominal segment of female not truncated, but subtriangular with a rounded ventral median crest and a marginate groove on either side and with scattered setigerous punctures; male last segment not clearly truncated, but appearing so in some specimens due to flexing on either side of the asymmetrical median crest; slightly produced at apex, with scattered setigerous punctures; hind margin of male fifth visible segment with creases or protuberances on either side of midline, the left more prominent than the right. *Legs*: male pro- and mesotarsi swollen laterally as well as enlarged in a dorsoventral plane; fifth tarsal segments on both pair of front legs more than twice as long as corresponding fourth; palettes easily visible at 20 power magnification; profemoral marginal setae (10 on male; 7 to 8 on female). *Genitalia*: oval plate with produced acuminate tip with ventral crest extending anteriorly with slight curve to the left nearly to front of plate; prominent raised lines on either side; aedeagus bent near base and subapically, relatively straight between; ovipositor with about nine pair of spaced, rakelike teeth.

Laccophilus vacaensis vacaensis Young, new status
(Figs. 139-148, 150, 153, 313, 314)

Laccophilus vacaensis Young, 1953a, pp. 31-34. *Holotype*: University of Michigan Museum of Zoology, male; near Marathon, Vaca Key, Florida, viii.22.49, J. S. Haeger and F. N. Young; Young, 1954, p. 46; Young, 1963, p. 5.

DIAGNOSIS. — *L. v. vacaensis* has an irrorated pattern and color similar to a dozen other species of North American *Laccophilus,* but possesses structural characters in both males and females that permit comparatively easy identification. The males have the fifth segment of the two front pair of tarsi more than two and a quarter times as long as the corresponding fourth. Other species do not exceed twice the length. Females have a crease, immediately above the epipleuron, that extends nearly two-thirds the length of the elytron. The presence of this crease seems to be directly related to the longer tarsal segment of the males. The distance from the ventral margin of the epipleuron to the crease is about the same as the length of the fifth tarsal segment, so this is probably an adaptive feature to assist the male to grasp the female for copulation.

L. v. vacaensis is most likely to be confused with the sympatric species, *L. proximus* and *L. spangleri.* In the first case, the lack of a file in the male and the presence of a forklike, instead of sawlike, ovipositor in the female will assist — along with the characters given above. *L. spangleri* can be best separated by the male shorter fifth tarsal segment or by the weaker crease on the female elytra and by the male aedeagus.

VARIATION. — The degree of pigmentation of the pronotum and of the elytral pattern varies considerably in this race. Specimens from Yucatan and Central America are much darker than those from Texas and the east coast of Mexico, with the individual dots of the pattern tending to form more continuous chains of five or six dots. A few specimens tend to be dark enough to suggest suffusion of pigment rather than irroration. Central American specimens have a prominent darkened area on the anterior margin of the pronotum between the eyes, while those from farther north may have only a faint suggestion of reddish-brown or brown color.

Males appear to average 0.05 to 0.10 mm larger than females, but the largest specimen examined was a female (fig. 16). There seems to be a geographical difference in size, since the specimens from Guatemala and Costa Rica (especially the latter) are almost 0.1 mm larger than those from south Texas and almost 0.25 mm larger than those from Progreso, Yucatan. There are too few samples to decide whether the difference in size is racial, clinal, or local.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — The range of this race is a wide one and a perplexing one. It was first described from a single locality from the Florida Keys and is now known to occur on several Caribbean Islands as well. It should occur clear around the Gulf of Mexico, but it has not been reported from Alabama or Mississippi. It is found in lowlands of Central America (fig. 15). This part of its distribution is entirely logical, if one assumes that it occurs in temporary pools and ponds that are often subject to temperatures above 40° C.; but the rest of the distribution is more difficult to explain; making it appear that another unrecognized race is involved. It has been collected from several localities at 5000 feet or above in Morelos, Jalisco, Sonora, and Arizona. It would thus be expected that these populations should be closer to *v. chihuahuae,* which more typically occurs at the higher elevations; but they are not.

Young (1953a) collected *vacaensis* in a small freshwater pool in which the principal vegetation was *Chara.* The pool was drying up, the surface was unshaded, and the noon temperature of the surface water may have exceeded 40° C. I have collected a large number of specimens from what may have been a brackish temporary pool about a mile inland from an extensive mangrove swamp near Progreso,

Yucatan. The water was very dark, only a few inches deep, and filled with debris, but had some emergent, grassy vegetation. Interestingly enough, *vacaensis* was taken in association with *L. quadrilineatus mayae* and Young (1963) also described *vacaensis* as being in association with *L. inagua* Young in the Bahamas. *L. inagua* most resembles *q. mayae* among North American and West Indian *Laccophilus*.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ARIZONA.** *Santa Cruz County.* Pena Blanca, Pajarito Mts., 2 ♂, 1 ♀, vii.19.62, Arnett and Van Tassel (CUA). **LOUISIANA.** *Cameron County.* Cameron, 1 ♀, vii.10-14.05, Van Dyke? (CAS). **TEXAS.** *Bastrop County.* 1 ♀, vii.13.37 (TAM). *Cameron County.* Brownsville, 3, vi.—.—; 16, —.—.— (USNM); 1 ♂, ii.24.96, H. F. Wickham (AMNH); 1 ♀, x.—.42, E. S. Ross (CAS); 1 ♂, ii.—.—, Wickham (ANSP); 1 ♂, Wickham (MCZ). Port Isabel, 1 ♂, 7 ♀, x.20.49, O. Bryant (CAS). *Hidalgo County.* Edinburg, 1, ii.24.36, J. G. Needham (CNL). *Kleberg County.* Kingsville, 4, —.—.—, C. T. Reed (CNL); 1 ♀, x.20.61, B. McDaniels; 1 ♂, xi.5.59 (USNM). *Victoria County.* Victoria, 3, ix.18.14, J. D. Mitchell (USNM); 1, ix.22.14 (USNM).

BRITISH WEST INDIES. — **BAHAMAS.** Great Inagua Is., Matthewtown, 8 ♂, 7 ♀, i.31.53, L. Giovannoli & E. B. Hayden; New Providence Is., Nassau, 1 ♀, iv.5.53, E. B. Hayden (AMNH).

CUBA. — Santiago, Vista Alegra, 1, vi.16.42, C. T. Randall (USNM).

HAITI. — Attelye, 1 ♂, 1 ♀, x.22.25, W. A. Hoffman (USNM).

COSTA RICA. — Bagaces, 2 ♂, 2 ♀, vii.12.57, D. R. Lauck; La Cruz, 16 m. S., 100+, vii.25.63; Liberia, 12 m. SW., 1 ♂, vii.25.65; 5 m. SW., 22 ♂, 31 ♀, vii.24.65, P. J. Spangler (USNM).

GUATEMALA. — Aldea Jesus Maria, 6 ♂, 6 ♀, viii.15.65, P. J. Spangler (USNM).

MEXICO. — **CAMPECHE.** Champoton, 11 m. SW., 1 ♂, ix.27.63, JRZ (NMSU). **JALISCO.** Guadalajara, 11 m. S., 2 ♂, 1 ♀, vii.30.62, JRZ (NMSU). Jiquilpan, 15-20 m. W., 1 ♂, xi.30.48, E. S. Ross (CAS). Near Cuautla, 1 ♀, 3 ♀, viii.28.62; Puente de Ixtla, 1 ♀, viii.29.62, JRZ (NMSU). **SINALOA.** Mazatlan, 2 ♂, viii.1.62; 1 ♀, xii.11.62, JRZ (NMSU). **SONORA.** Aribabi (E. of Moctezuma), 2 ♂, xii.15.62, JRZ (NMSU). Naco, 1 ♀, viii.15.49, G. M. Bradt (AMNH). **TAMAULIPAS.** Llera, 20 m. S., 1 ♂, iii.24.63, JRZ (NMSU). Matamoros, 15 m. S., 1 ♂, vi.10.60, F. N. Young (UMMZ). **YUCATAN.** Progreso, 5 m. S., 128 ♂, 229 ♀, xi.24.63, JRZ (NMSU).

Laccophilus vacaensis chihuahuae, new subspecies

(Figs. 146, 149, 152, 312)

DESCRIPTION AND DIAGNOSIS. — *L. v. chihuahuae* differs from *v. vacaensis* in its lighter color, less extensive elytral pattern, smaller size, highly

modified female epipleura, and the structure of the male aedeagus. Yellow or yellowish-brown predominates as the principal base color of *chihuahuae* instead of the reddish-brown that is much more apparent in *vacaensis*. The irroration of *chihuahuae* is less intense with the individual dots smaller and more discretely separated from one another. The average size of *chihuahuae* is about 0.3 to 0.4 mm shorter than *vacaensis*. The width of the pronotum exceeds the length 2.50 times in the latter and 2.57 times in the former (n = 8 for each race). The female epipleura and male aedeagus are most strikingly different characters, however. The female epipleuron of *chihuahuae* almost always has a flange and an unusual conformation immediately anterior to it. The epipleuron is modified so that a groove can be distinguished even when the flange is comparatively small. This does not appear in *vacaensis*, but does in *v. thermophilus*. The aedeagus of *vacaensis* has a rather sinuate appearance, while that of *chihuahuae* is comparatively straight except just before the apex where it abruptly narrows to a curving bent tip. Also, if cut in cross-section at about half its length, the aedeagus would have a decidedly triangular outline. This is only suggested in *vacaensis*.

The aedeagus is the only reliable way to separate *chihuahuae* and *thermophilus*, although the latter seems to be slightly larger (Table 21).

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. —*L. v. chihuahuae* ranges from the hill country of central Texas through west Texas, New Mexico, and Cochise County, Arizona (fig. 15). I have collected it only in short-lived ephemeral ponds that occur after the summer rains in the flats between the separated mountain ranges of New Mexico, Arizona, and west Texas. This ephemeral condition seems to be the reason this race is so seldom collected. It does occur in the lower reaches of some mountain streams, however.

MATERIAL EXAMINED

Holotype male, *allotype* female, and a male paratype with the following locality data are in the United States National Museum: Boquillas, Big Bend National Park, Brewster County, Texas, viii.2.61, J. R. Zimmerman. One male and two female paratypes with the following data are in the California Academy of Sciences, San Francisco: 1 m. S. of Animas, Hidalgo County, New Mexico, vii.31.65, H. B. Leech; one male paratype, 5 miles N. of Tombstone, Cochise County, Arizona, ix.6.61, J. R. Zimmerman, and one female, 10 m. E. of Marathon, Brewster County, Texas, viii.1.61, J. R. Zimmerman, in the University of Michigan Museum of Zoology, Ann Arbor; and another female paratype from the same locality is also in the United States National Museum.

UNITED STATES OF AMERICA. — ARIZONA. *Cochise County*. Chiracahua Mtns., Cave Ck. Can., 1 ♀, ix.13-14.52, B. Malkin (FM). Huachucha City, 2 ♂, 3 ♀, ix.6.61, JRZ (NMSU). Rodeo (N.M.), 2 m. NW., 2 ♂, 2 ♀,

ix.5.61, JRZ (NMSU). Tombstone, 5 m. S., 1 ♂, 1 ♀, ix.6.61, JRZ (NMSU). **NEW MEXICO.** *Harding County.* Mosquero, 10 m. E., 1 ♀, x.23.65, A. H. Smith (NMSU). *Hidalgo County.* Rodeo, 1 ♀, viii.31.59, H. E. Evans (CNL); 12 m. N., 1 ♂, 2 ♀, ix.5.61, JRZ (NMSU). **TEXAS.** *Bexar County.* Leon Ck., 1 ♂, 3 ♀, x.11.52, B. J. Adelson (CAS). *Brewster County.* Boquillas, 1 ♀, vii.7.48, C. & P. Vaurie (AMNH); 3 ♂, 4 ♀, viii.2.61, JRZ (NMSU). Marathon, 10 m. E., 4 ♀, viii.1.61, JRZ (NMSU). *Burnett County.* 1 ♂, 8 ♀, Hubbard and Schwarz (USNM). *Culberson County.* Nickel Ck. Sta., 2.5 m. E., 2 ♀, ix.2.52, B. Malkin (FM). *Lee County.* Fedor, 1 ♀ (CNG). *Webb County.* Laredo, 2 ♂, v.20-24.48, W. Nutting and F. Werner (ARI).

Laccophilus vacaensis thermophilus, new subspecies (Fig. 154)

DESCRIPTION AND DIAGNOSIS. — *L. v. thermophilus* differs from *L. v. vacaensis* in much the same way that *chihuahuae* does; i.e., in color, pattern, size, and sexual characters. It appears to differ from *chihuahuae* only in the structure of the male aedeagus and perhaps in being slightly larger. The tip of the aedeagus is blunter than that of *chihuahuae.* The relative length of the pronotum is almost the same as *vacaensis* (2.52 times as wide as long). This race appears to occur all around the Gulf of California; but, as yet, the records are too scattered for verification. It apparently prefers the same kind of habitat as *chihuahuae,* but in a hotter climate.

VARIATION. — The specimens from Baja California average much larger than the ones from Sonora. However, there are only a total of six specimens available from the latter area. The standard deviations are high enough to suggest that even that material is mixed. Since all three races of *vacaensis* might occur in that area, it is entirely possible that there is some intergradation represented in the Sonoran specimens determined as *thermophilus.*

MATERIAL EXAMINED

Holotype male, *allotype,* and fifteen paratypes with the following data from 8.2 m. W. La Pas on Hwy. Sur No. 1, Baja California Sur, xii.13.58, H. B. Leech are in the California Academy of Sciences, San Francisco.

UNITED STATES OF AMERICA. — **ARIZONA.** *Pima County.* Arivaca, Arivaca Ck., 1 ♂, vii.31.52, H. B. Leech (CAS).

MEXICO. — **SINALOA.** Mazatlan, 1 ♀, xii.11.62, JRZ (NMSU). **SONORA.** Pitiquito, 2 m. E., 1 ♂, viii.1.50, J. Figg-Hoblyn (CAS). Desemboque, 1 ♀, ix.1-10.53; Navojoa, 1 ♀, ix.26.53, B. Malkin (CAS). Guaymas, 2 ♀, ix.29.23, W. M. Mann (USNM).

Laccophilus spangleri, new species (Figs. 155-162, 315)

DIAGNOSIS. — *Laccophilus spangleri* can best be identified by the follow-

Figure 15. Distribution of *Laccophilus vacaensis* and *L. spangleri.*

ing combination of characters: irrorated pattern, lack of file in males or females, rakelike ovipositor, and the fifth front tarsal segment less than twice as long as the corresponding fourth. The rakelike ovipositor and lack of a file separates *spangleri* from most irrorated species, but it is easily confused with *vacaensis* and *peregrinus.* Its size is intermediate and overlaps with both species. The front tarsal segment of the males of *vacaensis* is more than twice as long as the corresponding fourth and helps to separate males, but females cannot be separated with complete assurance. Irroration in *spangleri* tends to be darker with more fusion of the individual dots. In specimens from Mexico the "fingers" that form the anterior part of the elytral pattern are more clearly defined and do not tend to fuse anteriorly, while in *v. vacaensis* there is considerable fusion with discrete "fingers" not really apparent. South of Mexica, this is not a reliable difference. The darkened area on the head and pronotum is more apparent in *spangleri* than in *vacaensis.*

L. proximus and *L. fuscipennis,* which are sympatric with *spangleri* in Veracruz and have similar patterns and color, have metacoxal files in the males and sawlike ovipositors in the females. *L. peregrinus peregrinus* has a similar aedeagus and ovipositor; but in Veracruz the elytral pattern is more uniform than

spangleri, and the average size is about 0.3 to 0.5 mm shorter (Tables 22, 24).

DESCRIPTION. — Medium (length, 4.1 to 4.8 mm; width, 2.3 to 2.7 mm), brown, irrorated species; metacoxal file absent; prosternal process short; ovipositor rakelike. COLOR. *Head*: generally pale brownish-yellow tinged with red above and beneath except for some dark reddish-brown on the occiput between the eyes. *Pronotum*: pale yellowish-brown except anteriorly between the eyes; here darker color matches the darkened area of the head; some of the darker color trails weakly across the disc and the apex may be translucently reddish-brown. *Elytra*: heavily irrorated, reddish-brown pattern on yellow background; considerable coalescence of dots especially around margins of pattern; epipleura pale anteriorly and reddish-brown posteriorly. *Tergite VIII*: basally dark brown, but posterior half light yellowish-brown. *Venter*: variably light yellowish-brown with reddish tinge; front two pair of legs usually lighter than rest; sutures, coxal bases usually darkened. *Genitalia*: about the same color as venter. ANATOMY. *Microreticulation*: clearly double on much of the head and pronotum, but only weakly so on the elytra, especially in females; surface shining. *Head*: supraclypeal seam arching slightly upward at center above margin. *Pronotum*: WH/PW, 0.70; LP/PW, 0.40. *Elytra*: slight truncation of apices; female epipleura without flange. *Venter*: prosternal process with a median crest that nearly attains the anterior prosternal margin; postcoxal processes rounded, laterally projecting slightly posterior to the midline; last visible segment of males slightly truncated with produced apex and with an asymmetrical median crest; a small tuberosity near the left hind margin of the next to last ventral segment; last female segment not truncated, but nearly triangular; marginate groove on either side of the apex; both sexes with numerous setigerous punctures. *Legs*: pro- and mesotarsi enlarged in a dorsoventral plane; fifth tarsal segment of both legs about one and three-quarters as long as the corresponding fourth; palettes easily visible at 20 power magnification; profemoral setae (6 or 7) smaller and shorter than mesofemoral ones (6 to 8). *Genitalia*: oval plate with produced acuminate tip; its ventral crest curving slightly to the left as it extends anteriorly to near front margin; numerous raised lines of varying thickness on either side of the crest; aedeagus curving without noticeable angle; unevenly tapered to small knob at apex; ovipositor with about eight pairs of rakelike teeth.

VARIATION. — The elytral irroration varies in intensity and in the degree to which the dots tend to coalesce. In some specimens from Veracruz, the color is almost completely suffused with little evidence of irroration. South of Mexico there is much more spreading and fusing of the "fingers" so that the most anterior part of the pattern has a more solid appearance similar to that of *vacaensis.*

Females are slightly larger than males (Table 13, fig. 16), but there is almost complete overlap. There is no clear geographic trend in overall size, as seen by the similarity of means for the samples from La Tinaja, Veracruz, and from San Benito, Nicaragua.

Table 13. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus spangleri*.

Locality		N	length		elytral length		width		pronotal width		PW/EL	t_{95}
Tantoyuca,	♂	10	4.34	0.098	3.42	0.078	2.38	0.051	1.89	0.031	0.553	0.0069
Veracruz	♀	13	4.46	0.136	3.56	0.110	2.42	0.073	1.93	0.047	0.542	0.0057
La Tinaja,	♂	19	4.53	0.095	3.60	0.082	2.51	0.068	2.00	0.050	0.556	0.0042
Veracruz	♀	21	4.59	0.149	3.68	0.133	2.56	0.097	1.98	0.070	0.537	0.0024
Tehuantepec,	♂	35	4.32	0.150	3.36	0.144	2.40	0.098	1.91	0.082	0.567	0.0048
Oaxaca	♀	59	4.46	0.174	3.55	0.142	2.46	0.110	1.94	0.080	0.547	0.0027
Esteli,	♂	15	4.62	0.117	3.67	0.125	2.56	0.061	2.05	0.051	0.559	0.0097
Nicaragua	♀	9	4.66	0.104	3.71	0.097	2.59	0.058	2.05	0.042	0.551	0.0070
San Benito,	♂	36	4.45	0.172	3.53	0.137	2.46	0.107	1.98	0.079	0.560	0.0031
Nicaragua	♀	36	4.57	0.184	3.65	0.159	2.57	0.104	2.02	0.084	0.553	0.0028

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This species has been taken from several localities in northern and central Veracruz, from three localities on the south side of the Isthmus of Tehuantepec, and in Honduras and Nicaragua (fig. 15). Additional collecting will probably show that it occurs in most of the coastal regions of southern Mexico and Central America. It is a tropical lowland species. It seems to prefer temporary pools that are frequently subject to high surface temperatures, and that are located in clay soils.

MATERIAL EXAMINED

Holotype male, *allotype* female, five male, and five female paratypes with the following locality data are in the United States National Museum; Tehuantepec, Oaxaca, ix.2.63, J. R. Zimmerman. One male and one female paratype with the same locality data are also in each of the following collections: California Academy of Sciences, San Francisco, the University of Michigan Museum of Zoology, Ann Arbor, in the Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico.

HONDURAS. — San Marcos Colon, 3 ♂, 2 ♀, vii.28.65, P. J. Spangler (USNM).

MEXICO. — **OAXACA.** Juchitan, 20 km. N., 3 ♂, 2 ♀, ix.7.64; 3 m. E., 8 ♂, 33 ♀, ix.7.64; Tehuantepec, 26 ♂, 23 ♀, ix.2.63, JRZ (NMSU). **VERACRUZ.** Cuitlahuac, 1 ♂, viii.25.62; near La Tinaja, 10 ♂, 8 ♀, viii.25.62; Paso de Ovejas, 10 ♂, 13 ♀, viii.27.62, JRZ (NMSU). Poza Rica, 2 ♂, 1 ♀, viii.27.65; Tantoyuca, 15 m. SE., 8 ♂, 12 ♀, viii.28.65, P. J. Spangler (USNM).

NICARAGUA. — Esteli, 9 m. N., 14 ♂, 9 ♀, vii.10.65; La Trinidad, 1 ♀, vii.27.65, P. J. Spangler; Rivas, 1 ♂, vii.31.67, O. S. Flint; San Benito, 13 m. N., 36 ♂, 28 ♀, vii.11.65; Somoto, 3 ♂, 5 ♀, vii.11.65, P. J. Spangler (USNM).

LACCOPHILUS PEREGRINUS

This is a highly variable, polytypic species that ranges from Sinaloa and Veracruz, south to Panama, and probably into South America. It is composed of two races that are roughly separated by the Isthmus of Tehuantepec. The northern race, *peregrinus,* has two allopatric populations, which conceivably could be split even more into separate races; but lacking any character that could be demonstrated as consistently different between the two, they were retained as one. Veracruz populations have enough elytral pattern variation that some individuals with an irrorated pattern could readily be included in the west coast population. Others, however, have almost uniformly reddish-brown elytra and, hence, look quite different from the irrorated ones. The data from measurements are too incomplete to show much difference in the two populations and, in fact, show a close similarity when

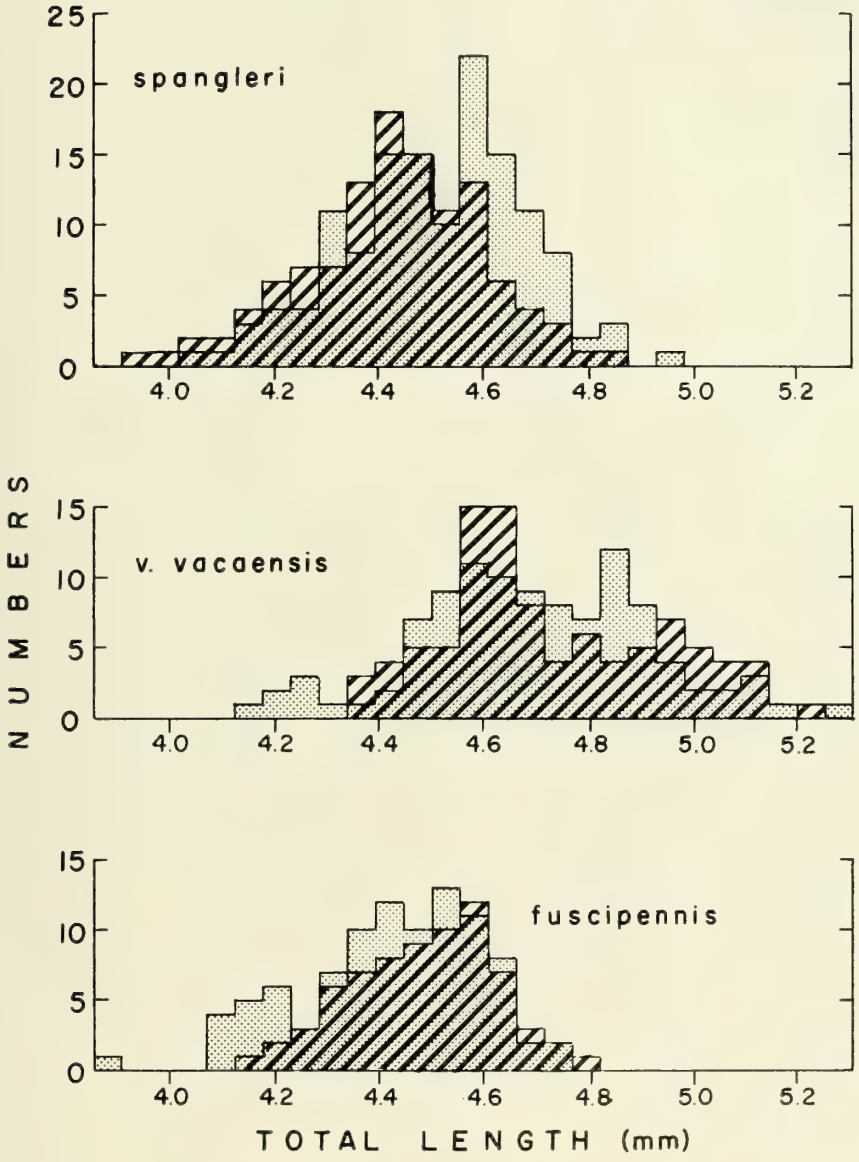

Figure 16. Histograms of length in *Laccophilus v. vacaensis, L. spangleri,* and *L. fascipennis.* Males are shown crosshatched; females, stippled.

compared to the values obtained for *variabilis*. The structure of the aedeagus supports retaining them as a single race, also.

The southern race, *variabilis*, has an even more heterogenous appearance than *peregrinus*. It varies from a black and yellow variegated form to one with nearly uniformly black elytra to one with a pattern which is found in typical *peregrinus*. The variation occurs in a north-south direction, so that the unlikely situation exists that individuals from Panama superficially most resemble those from Sinaloa. The quantitative data, however, show enough uniformity to suggest no great separation or differentiation of the different *variabilis* populations.

In this species elytral pattern has been less reliable for the recognition of intergrades than comparison of male aedeagi. In other species, *L. maculosus* and *L. fasciatus* for example, the pattern has frequently manifested intergrade features while the aedeagus did not. Only in a few instances were individual males found that had an aedeagus that clearly represented the intermediate condition. In *L. peregrinus* in Chiapas both races are represented as judged by elytral patterns. The southern race was taken in Ixtapa and nearby Chiapa de Corzo and the northern race in Comitan, which is about 90 miles closer to Guatemala. Other specimens of the southern *variabilis* were taken from three other localities in Oaxaca. None showed any intergradation in elytral pattern; but the males have unmistakenly intermediate aedeagi, and the aedeagi of the various Chiapas males are virtually identical.

Additional evidence for intergradation is found in the quantitative data.

The mean values for all four measurements for the Ixtapa and Chiapa de Corzo females are larger than for any of the other *variabilis* populations and approaches the value for typical *peregrinus* females (Table 14). In figure 18, 13 of the 18 largest individuals are females from Chiapas. Note that these females lie at about the mean value for *p. peregrinus* females (and males). This suggests that the larger size is due to gene flow from the northern race.

Laccophilus peregrinus, new species (Figs. 163-172)

DESCRIPTION. — Small (length, 3.3 to 4.6 mm; width, 1.9 to 2.6 mm) species; elytral pattern highly variable from brown to reddish-brown, black, or yellow and black, irrorated, unicolorous, or variegated; metacoxal file absent; prosternal process short; ovipositor rakelike. COLOR. *Head*: yellow darken-

Table 14. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus peregrinus*.

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
L. p. peregrinus													
Sinaloa	♂	17	4.13	0.141	3.31	0.137	....	2.29	0.087	1.80	0.052	0.544	0.0073
	♀	11	4.23	0.203	3.41	0.186	....	2.33	0.126	1.84	0.093	0.538	0.0029
Nayarit	♂	9	4.15	0.126	3.35	0.089	....	2.29	0.059	1.84	0.049	0.549	0.0059
	♀	15	4.09	0.143	3.32	0.103	....	2.28	0.096	1.79	0.075	0.539	0.0059
Jalapa, Veracruz	♂	2	4.00	.....	3.19	.....	....	2.24	.....	1.75	.....	0.551	.....
La Tinaja, Veracruz	♂	18	4.03	0.126	3.23	0.104	....	2.24	0.088	1.76	0.056	0.546	0.0039
	♀	24	4.05	0.136	3.24	0.110	....	2.24	0.088	1.75	0.071	0.539	0.0036
Garro, Veracruz	♀	4	4.12	0.120	3.27	0.093	....	2.28	0.081	1.77	0.059	0.535	.....
Comitan, Chiapas	♀	4	4.10	0.077	3.29	0.044	....	2.26	0.046	1.80	0.046	0.547	0.0115
L. p. variabilis													
Tapanatepec, Oaxaca	♂	3	3.71	0.031	2.97	0.054	....	2.08	0.027	1.60	0.040	0.539	0.0343
	♀	3	3.71	0.056	2.98	0.068	....	2.06	0.041	1.59	0.000	0.535	0.0301
Ixtapa, Chiapas	♂	13	3.84	0.057	3.08	0.063	(11)	2.13	0.044	1.69	0.027	0.550	0.0064
	♀	14	4.06	0.081	3.27	0.072	(13)	2.22	0.066	1.76	0.043	0.537	0.0048
Nicaragua	♂	59	3.64	0.117	2.82	0.119	(48)	2.00	0.063	1.60	0.054	0.566	.....
	♀	39	3.75	0.096	2.93	0.075	(34)	2.12	0.273	1.64	0.038	0.559	.....
Costa Rica	♂	62	3.71	0.114	2.97	0.087	....	2.05	0.079	1.62	0.053	0.546	0.0017
	♀	37	3.81	0.112	3.05	0.098	....	2.08	0.080	1.65	0.056	0.542	0.0045
Panama	♂	19	3.83	0.094	3.08	0.082	....	2.15	0.049	1.67	0.027	0.543	0.0087
	♀	7	3.97	0.095	3.15	0.069	....	2.24	0.056	1.73	0.029	0.549	0.0081

ing to brown or reddish-brown on the occiput between the eyes. *Pronotum*: pale brownish-yellow except for prominent dark reddish-brown or brown on the anterior margin between the eyes and a somewhat less distinct area at the apex. *Elytra*: pattern varying from irregularly irrorated brown on a pale yellowish-brown background to one that is almost entirely unicolorous reddish-brown or very dark brown or black; or is variegated with yellow and dark brown or black; epipleura pale anteriorly and pale or dark posteriorly. *Tergite VIII*: basally dark brown, but lightening to yellowish-brown along the hind margin. *Venter*: pro- and mesolegs pale reddish-yellow brown, remainder darkening to medium shades of the same color; abdominal sternites usually darker than thorax and metacoxal plates. *Genitalia*: reddish- or yellowish-brown. ANATOMY. *Microreticulation*: double on head, pronotum, and elytra. *Head*: supraclypeal seam arching slightly upward above the margin. *Pronotum*: WH/PW, 0.71; LP/PW, 0.38 to 0.39. *Elytra*: somewhat attenuated, truncation barely perceptible; female epipleura usually with a flange in *p. peregrinus*, but almost never in *p. variabilis*; crease apparent immediately above the female epipleura and extends about one-third the distance along the elytron. *Venter*: prosternal process with well-defined crest extending from apex to level of line drawn across the front margins of procoxal cavities; postcoxal processes rounded and laterally projecting slightly beyond the midline; last visible segment not truncated in either sex; rounded in males with very slight production of the apex in males and subtriangular in outline in females; males with asymmetrical curving crest; females with marginate groove extending from anterior lateral margin of segment to near apex; scattered setigerous punctures accumulating toward hind margin in both sexes. *Legs*: pro- and mesotarsi enlarged in a dorsoventral plane; fifth tarsal segments on both pair of front legs about twice as long as corresponding fourth segment; palettes easily visible at 20 power magnification; profemoral setae (5 or 6) much finer and shorter than the mesofemoral ones (5 or 6). *Genitalia*: oval plate with acuminate produced tip; median crest of plate extending anteriorly with little or no curvature; about three or four raised lines on the left side of crest and about twice that number on the right; aedeagus with strong bend at about half its length and another lesser one subbasally; right paramere smaller than left; ovipositor with four pair of long wide-spaced distal teeth and about five more smaller proximal ones.

Laccophilus peregrinus peregrinus, new subspecies (Figs. 316, 317)

DESCRIPTION AND DIAGNOSIS. — Elytral pattern and aedeagus provide the only reliable clue for identification of *L. p. peregrinus* within the group of species that lack a metacoxal file and have a rakelike ovipositor. The size ranges from a length of 3.7 to 4.6 mm and width of 2.1 to 2.6 mm. Other species with a similar irrorated pattern are *L. spangleri*, *L. vacaensis* and *L. proximus*. It is sympatric with all of them. *L. proximus* has no pronotal darkening, has a metacoxal file, and has a sawlike ovipositor. The males of *vacaensis* have the fifth tarsal segment on both pair of front legs well over twice the length of the corresponding fourth, while it is only twice the length in

peregrinus. The microreticulation of the elytra of *vacaensis* is single and gives a more pebbled appearance than would be seen in *peregrinus.* The pronotal anterior dark area is much more prominent in *peregrinus* than in *vacaensis* also. The crease above the epipleura is more pronounced and longer in *vacaensis* females than in *peregrinus* females. Both *vacaensis* and *peregrinus* have the epipleura often expanded with a flange, however. *L. vacaensis* (except *chihuahuae*) averages more than a half millimeter larger than *peregrinus.*

L. spangleri can often be very similar in appearance to *peregrinus*; but, usually, there is sufficient difference in the details of the elytral pattern of *spangleri* to permit separation from the irrorated pattern of *peregrinus.* If that of *peregrinus* is the suffused, nearly unicolorous type, then there should be no difficulty. Comparison of male genitalia may be necessary, however. There appears to be no flange developed on the female epipleura of *spangleri.* It is a larger species and averages up to half a millimeter longer.

L. huastecus bears a strong resemblance to *L. p. peregrinus,* even though it has a pattern that should more properly be considered suffused than irrorated; but with the brown on the front of the head and the pebbled appearance of the elytra, there should be no difficulty in separation.

L. p. peregrinus differs from *L. p. variabilis* in the structure of the male aedeagus, in the color and pattern of the elytra, in its generally larger size, and in the frequent presence of a flange on the female epipleura. The aedeagus is blunter and heavier in *peregrinus.* The elytra are more reddish-brown than brown or black and are not variegated. The length of *peregrinus* ranges from 3.7 to 4.6 mm as compared to 3.3 to 4.2 mm in *variabilis.* The average length of *peregrinus* is about 4.1 mm and that of *variabilis* about 3.7 to 3.8 mm.

VARIATION. — The principal pattern variation is occurrence of both an irrorated pattern and a suffused, nearly unicolorous one. All degrees of intermediacy are present. Even when there is no trace of irroration, it is still possible to distinguish the areas that are normally pale yellow-brown in the irrorated pattern. This variation is probably geographical since it seems to be most common in southern Veracruz and Chiapas; but without more information, it is not possible to decide whether there is a clearly demonstrable intergrade zone or whether the situation is clinal.

Females tend to be larger than males (Table 14, fig. 18), but the overlap is great enough that, in Nayarit, the mean values were larger for males than for females and, in Veracruz, the means were virtually the same. There is no clear difference in the size of populations from the west coast versus those from Veracruz. The small sample from Chiapas gives about the same values.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — The race has been taken at several localities on or near the coastal plain in Sinaloa and Nayarit. The northernmost record is from Mazatlan, and the southernmost one is San Blas, Nayarit; but it undoubtedly occurs to the north and south of that area. It occurs throughout Veracruz at lower elevations (fig. 17). I have most frequently taken it in temporary ponds with clay bottom and grassy margins.

MATERIAL EXAMINED

Holotype male, *allotype* female, and two male and female paratypes from 4 miles west of Esquinapa, Sinaloa, iv.12.68, J. R. Zimmerman, are in the United States National Museum. Other paratypes include a male and female from Poza Rica, Ruinas El Tajin, Veracruz, viii.27.65, P. J. Spangler, United States National Museum; a male from Mazatlan, Sinaloa, viii.14.60, Arnaud, Ross, and Rentz, California Academy of Sciences, San Francisco, California; and a male and female with the same locality data as the holotype are in the University of Michigan Museum of Zoology, Ann Arbor, and in the Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico.

MEXICO. — **CHIAPAS.** Comitan, 2 ♂, 4 ♀, viii.30.63, JRZ (NMSU). **NAYARIT.** Acaponeta, 12 m. S., 1 ♀, vii.31.62; San Blas, 5 m. E., 10 ♂, 16 ♀, vii.31.62, JRZ (NMSU). **SINALOA.** Mazatlan, 2 ♂, viii.14.60, Arnaud, Ross, Rentz (CAS); 1 ♀, viii.1.62; 4 ♂, 2 ♀, xii.11.62; Esquinapa, 4 m. W., 10 ♂, 8 ♀, iv.12.68, JRZ (NMSU). **VERACRUZ.** Cuitlahuac, 3 ♀, viii.25.62; Jalapa, 10 m. E., 6 ♂, 11 ♀, viii.27.62; near Garro, 3 ♀, ix.8.64; near La Tinaja, 12 ♂, 8 ♀, viii.25.62; Paso del Toro, 6 ♂, 17 ♀, viii.25.62; 15 km. W., 1 ♀, ix.5.64, JRZ (NMSU). Poza Rica, 1 ♂, 1 ♀, viii.27.65, P. J. Spangler (USNM). Santiago Tuxtla, 10 km. S., 1 ♂, 1 ♀, ix.8.64, JRZ (NMSU).

Laccophilus peregrinus variabilis, new subspecies (Figs. 318, 319)

DIAGNOSIS AND DESCRIPTION. — Elytral pattern is the best way to distinguish *L. p. variabilis.* The yellow and black, or nearly black, variegated pattern, or the almost uniform elytra of the same dark color are unique among North American *Laccophilus.* The irrorated pattern of Panamanian *variabilis* is quite similar to that of *p. peregrinus* in general appearance but differs in details of outline and in being more extensive. This latter pattern might be mistaken for *spangleri, vacaensis, huastecus,* and *proximus,* but *variabilis* can be separated in the same fashion as discussed for *peregrinus.* Some specimens of *p. peregrinus* have almost uniformly pigmented elytra, but they are reddish-brown. The aedeagus of *variabilis* is finer and is more tapered than in the nominate race. It is a smaller race; and the female almost never, if ever, has a flange on the female epipleuron as in *p. peregrinus.*

VARIATION. — The problem in *variabilis* is similar to that in typical *peregrinus* in that there is considerable variation in elytral pattern and the variation is geographical. Specimens from the more northern parts of the range are variegated, those from the central part tend to be unicolorous, and some from Panama are irrorated. Not enough is known, as yet, to delineate any separate races within the assemblage. There is also some change in the aedeagus from north to south.

Except for being smaller, the same statements for *peregrinus* apply to *variabilis*. There appears to be no geographical trend indicated by the data from measurements.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. p. variabilis* ranges from Oaxaca to Panama (fig. 17). While more frequently taken in coastal lowlands, it is also found at over 5000 feet in Ixtapa, Chiapas. It is in temporary ponds with clay bottoms, which have a considerable amount of emergent grass and sedges around the margins.

MATERIAL EXAMINED

Holotype male, and *allotype* female, from 13 m. N. San Benito, Nicaragua, vii.11.65, P. J. Spangler; paratypes as follows: six males and six females, same data as holotype, USNM; one male and one female, same data, in each of the following collections: California Academy of Sciences, San Francisco; University of Michigan Museum of Zoology, Ann Arbor; and Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico.

MEXICO. — **OAXACA.** Juchitan, 3 m. E., 1 ♀, ix.7.64, JRZ (NMSU). Oaxaca, 1 ♂, 1 ♀, vi.29.57, D. R. Lauck (USNM). Tapanatepec, 3 ♂, 2 ♀, ix.1.63, JRZ (NMSU). **CHIAPAS.** Chiapa de Corzo, 6 ♂, 9 ♀, ix.1.63; Ixtapa, 7 ♂, 5 ♀, viii.31.63, JRZ (NMSU).

COSTA RICA. — La Cruz, 16 m. S., 50 ♂, 50 ♀, vii.25.63; 1 ♀, vii.13.65; Liberia, 15 m. SW., 7 ♂, 8 ♀, vii.24.65; Taboga Agr. Exp. Sta., 55 ♂, 24 ♀, vi.27.67, P. J. Spangler (USNM).

EL SALVADOR. — La Union, 15 m. SW., 1 ♂, 1 ♀, vii.31.65, P. J. Spangler (USNM).

HONDURAS. — San Marcus Colon, 1 ♀, vii.28.65, P. J. Spangler (USNM).

NICARAGUA. — La Trinidad, 6 ♂, 2 ♀, vii.27.65; Rivas, 10 m. N., 1 ♂, vii.11.65; San Benito, 13 m. N., 63 ♂, 51 ♀, vii.11.65, P. J. Spangler (USNM).

PANAMA. — Anton, 5.3 m. E., 19 ♂, 7 ♀, vi.—.67; Algarrobos, 9 m. W., 2 ♂, 2 ♀, vii.5.67, P. J. Spangler (USNM).

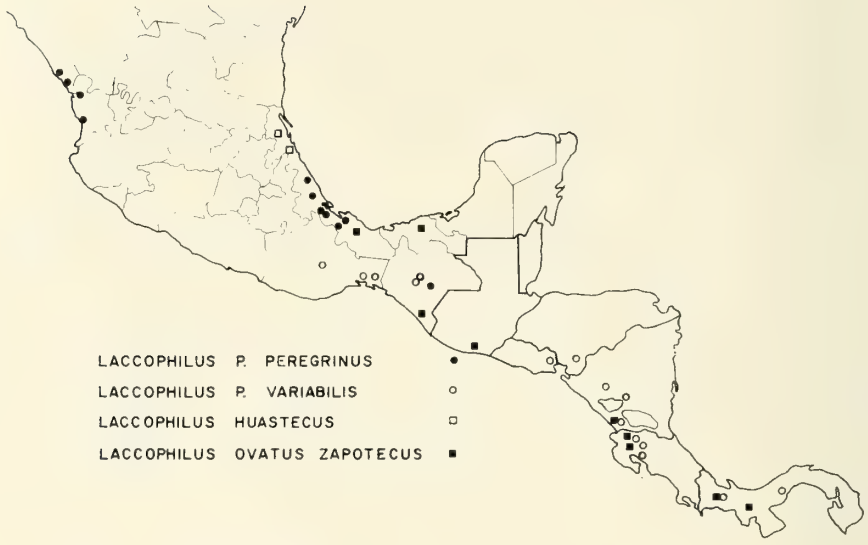

Figure 17. Distribution of *Laccophilus peregrinus, L. huastecus,* and *L. ovatus zapotecus.*

Laccophilus huastecus, new species (Figs. 183-191, 320)

DIAGNOSIS. — *L. huastecus* belongs to the group of species that have no metacoxal file, have a rakelike ovipositor, and have the elytral microreticulation single. It especially resembles *L. p. peregrinus* and *L. spangleri* with which it is sympatric in Veracruz. This species can be separated from all other North American species of *Laccophilus,* however, by the brown color present on the front of the head. It can also be distinguished from *peregrinus* by elytral pattern and male aedeagus. *L. p. peregrinus* has an irrorated irregular pattern, or suffused, nearly unicolorous reddish-brown elytra, while *huastecus* has a suffused irregular brown pattern with three distinct sub-basal elongated clear areas. It is possible that *huastecus,* as other species in the group mentioned above, may have the pattern expressed in irrorations as well as being suffused. In the three specimens upon which this description is based, one had a suggestion of irrorations on the lighter portions of the pattern. The aedeagus of *huastecus* is one that is gradually curved to a tapered tip, while that of *peregrinus* has a strong bend at about half its length and a blunt tip. The single female of *huastecus* I have seen had no suggestion of an epipleural flange, while almost all *peregrinus* females do have a flange.

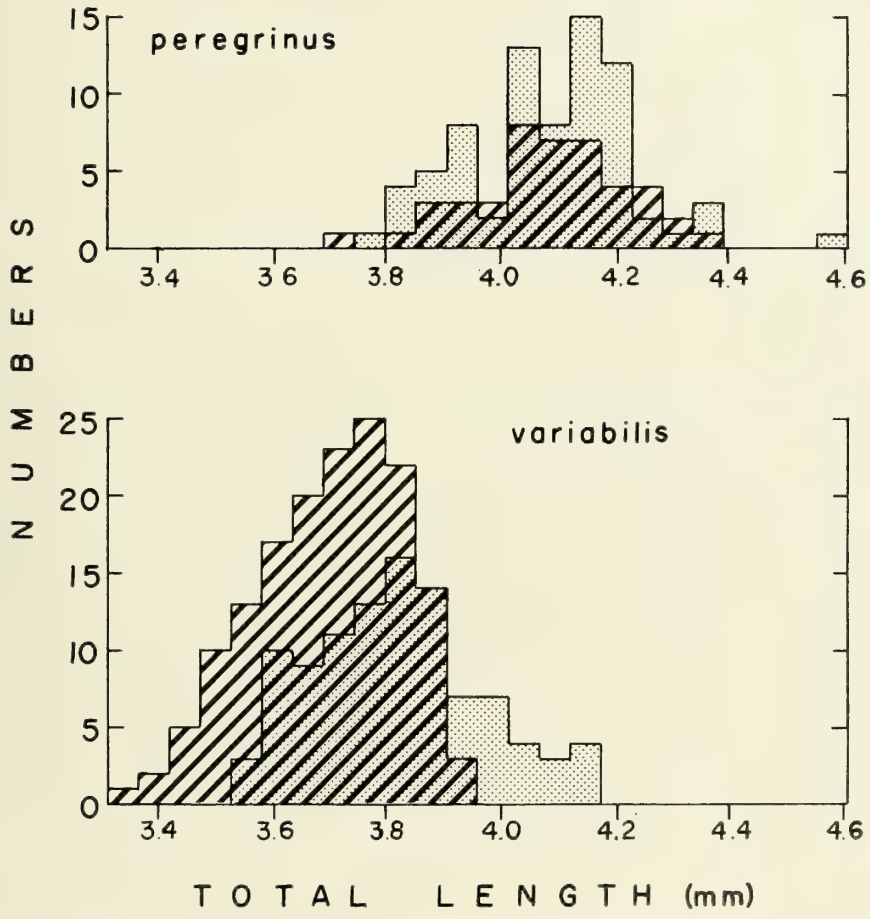

Figure 18. Histograms of length of *Laccophilus peregrinus*. Males are shown crosshatched; females, stippled.

L. huastecus is smaller than *spangleri*. The former is about 4.0 mm long and *spangleri* usually averages more than 4.4 mm. The elytral patterns of the two are similar, but that of *spangleri* is less extensive, especially subbasally, and has a much greater tendency toward irroration.

L. huastecus also resembles *peregrinus variabilis* anatomically; but the elytral patterns and male aedeagi can be used to separate them, in addition to the lack of brown on the front of the head of *p. variabilis*.

DESCRIPTION. — Small (length, 3.9 to 4.2 mm; width, 2.0 to 2.2 mm), dark brown and yellow species; metacoxal file absent; prosternal process short; ovipositor rakelike. COLOR. *Head*: yellowish-brown on front, dark brown on back between the eyes, darker immediately medial to eyes, but paler in center of head. *Pronotum*: pale yellow and very lightly tinged with reddish-brown except for dark brown on front margin between the eyes and at apex. *Elytra*: dark brown, irregular, suffused pattern on a yellow background; some suggestion of irrorations in lighter areas; pattern with three prominent elongated clear areas near base; epipleura pale anteriorly, darkened posteriorly. *Tergite VIII*: pale yellowish-brown distally but dark brown at base. *Venter*: pro- and mesolegs pale yellow; metacoxal plates darkened slightly with brown; last three abdominal sternites darkened to brown, while basal two remain pale brownish-yellow; hind legs about the color of basal sternites. *Genitalia*: yellowish-brown tinged with red. ANATOMY. *Microreticulation*: faintly double on head and pronotum, but single on the elytra. *Head*: supraclypeal seam arching upward at middle above margin. *Pronotum*: WH/PW, 0.69; LP/PW, 0.39. *Elytra*: truncation barely perceptible; somewhat attenuated. *Venter*: prosternal process with well-defined crest in apical third; postcoxal processes rounded laterally and projecting slightly posterior to midline; last visible segment not truncated, but rounded with slightly produced apex in males and subtriangular in females; males with asymmetrical curving median crest; females with marginate groove extending from anterior lateral margin of segment to near apex; both sexes with scattered setigerous punctures accumulating toward posterior margin. *Legs*: pro- and mesotarsi enlarged in a dorsoventral plane; fifth tarsal segment of prolegs slightly more than twice as long as corresponding fourth; profemoral setae (6 to 7) much finer and shorter than mesofemoral ones (6?). *Genitalia*: oval plate with triangular acuminate produced tip and median crest that extends anteriorly with slight leftward curvature; about six or eight raised lines on either side of the crest; aedeagus curving gradually to tapered tip; slight twist just before apex; right paramere smaller than left, apex blunted; ovipositor with five pair of wide-spaced distal teeth and about five pair of much smaller sawlike ones proximally.

VARIATION. — The single female examined is larger than both males. The elytral patterns of the three are much alike and differ primarily in color intensity.

GEOGRAPHICAL RANGE. — This species is known from two localities in the northern third of Veracruz. One male was taken from

the ruins at El Tajin near Poza Rica, and a male and a female were taken fifteen miles southeast of Tantoyuca (fig. 17).

MATERIAL EXAMINED

Holotype male, 15 m. SE. Tantoyuca, Veracruz (label gives Pue., but it has to be in Veracruz), Mexico, viii.28.65, P. J. Spangler; length, 4.10 mm; elytral length, 3.10 mm; width, 2.16 mm; pronotal width, 1.75 mm; PW/EL, 0.564. *Allotype* female, same locality data as male; 4.21 mm; 3.29 mm; 2.26 mm; 1.84 mm; 0.559; paratype, male, Poza Rica, Veracruz, viii.27.65, P. J. Spangler; 3.88 mm; 3.02 mm; 2.05 mm; 1.65 mm; 0.546.

Laccophilus raitti, new species (Figs. 173-182, 311)

DIAGNOSIS. — *L. raitti* belongs to the group of species which lack a metacoxal file, have a rakelike ovipositor, and vary in whether they are irrorated or not. *L. raitti* would generally not be considered irrorated; but, in one female, the pigmentation is sufficiently weakened to make it appear that there is some irroration with suffusion of color between dots. The lack of a file, and the elongated front tarsi in males, the widespread teeth on the ovipositor and the long crease above the epipleura in females, and the elytral pattern in both sexes should separate *raitti* from other *Laccophilus,* except *vacaensis. L. raitti* is very similar anatomically to *vacaensis,* but the latter has the male front tarsi comparatively longer, and has a slightly different conformation of the aedeagus; also, the crease above the epipleura on the elytra does not extend as far posteriorly. If the typical elytral pattern of *raitti* is present, however, there will be no difficulty in separating the two species. Some *L. peregrinus* have elytral patterns similar to that of *raitti,* but the race with which it is sympatric is irrorated and that difference is enough to permit field separation. The front tarsi of males are shorter, and the crease is weaker in females of *peregrinus*; and it is a smaller species. *L. spangleri* also belongs to this group, but it differs from *raitti* in the ways just enumerated for *peregrinus.*

DESCRIPTION. — Medium (length, 4.8 mm; width, 5.2 mm) brown and yellow variegated, marmorated, or irrorated species without metacoxal file; prosternal process short; ovipositor rakelike. COLOR. *Head*: generally pale brownish-yellow above and beneath, but with reddish-brown occiput between the eyes. *Pronotum*: pale brownish-yellow except for reddish-brown anterior margin between the eyes and confluent with dark color on head; also darkened less intensely at apex. *Elytra*: usually variegated with dark reddish-brown on a pale brownish-yellow background, dark area usually marmorated, but may be faintly irrorated with considerable suffusion of color between the dots (one specimen in a total of 14); epipleura pale anteriorly and translucent reddish-brown in narrowed posterior part. *Tergite VIII*: pale yellowish-brown. *Venter*: variably pale yellowish-brown or light reddish-brown; pro- and mesosternum and their legs usually lightest; abdominal segments and hind legs darkest. *Genitalia*: about the same as venter, except that the right paramere tends to be dark

Table 15. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus raitti*.

Locality		N	length		elytral length		width		pronotal width		PW/EL	t_{95}
San Blas,	♂	7	4.99	0.030	3.90	0.031	2.85	0.060	2.23	0.021	0.571	0.0036
Nayarit	♀	7	4.94	0.131	3.91	0.121	2.77	0.068	2.17	0.040	0.554	0.0088

reddish-brown. ANATOMY. *Microreticulation*: head and pronotum double over much of their surfaces, but elytra weakly double in males and scarcely or not at all in females which results in a pebbling similar to females of *vacaensis*; inner mesh cellules of head well-defined within the larger matrix. *Head*: supraclypeal seam arching slightly upward at middle above margin. *Pronotum*: WH/PW, 0.69; LP/PW, 0.39. *Elytra*: apices slightly truncated in both sexes; in females well-defined supra-epipleural ridge extending along most of the elytral length (apparent, but much weaker in males); female epipleura without flange (none in seven specimens). *Venter*: prosternal process with well-defined median crest in distal three-quarters; postcoxal processes rounded and laterally projecting posterior to the midline; last visible segment of both sexes not truncated, but rounded with a produced apex in males and subtriangular in females; males with an asymmetrical median crest; females with broad, triangular crest and marginate groove along hind margin; both sexes with a few small rugae and scattered setigerous punctures. *Legs*: male pro- and mesotarsi enlarged in a dorsoventral plane and also slightly dilated laterally; fifth tarsal segment of both pair of anterior legs twice as long as corresponding fourth; palettes easily visible at 20 power magnification; profemoral setae (female, 7; male, 8 to 10). *Genitalia*: oval plate with produced pointed apex; its ventral median crest bent to the left; numerous raised lines on either side of the crest; aedeagus sharply angled at about one-half its total length and with small knob at tip; right paramere with produced apex; ovipositor with five pair of rakelike teeth.

VARIATION. — Among the handful of specimens of this species that I have seen, the principal pattern variation is that, instead of pigment suffusing evenly over the elytra, there is a strong suggestion of irroration. Only one specimen out of 14 was clearly irrorated, but two more were slightly so. The intensity of the pigment varies from very dark to medium reddish-brown. The non-pigmented area of the elytra vary also.

Sexes appear to be about the same size with the means of all four measurements being statistically the same (Table 15). The condition of the specimens were somewhat poor, however; and better samples (and larger ones) are needed to make a reliable conclusion.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. raitti* is known from a single locality and collection. The specimens were taken in a roadside ditch about five miles inland on the coastal plain near San Blas, Nayarit. The pond was a shallow (no more than a foot deep at any point) temporary one with mud bottom and some grass around the margin. The surrounding vegetation was tropical evergreen forest. Seven other species of *Laccophilus* were taken from the same locality.

MATERIAL EXAMINED

Holotype male, *allotype* female, and a paratype of each sex with the following locality data are in the United States National Museum: 5 m. E. of San Blas, Nayarit, vii.31.62, J. R. Zimmerman. A paratype of each sex with the same data are also deposited in the California Academy of Sciences, San Francisco, the University of Michigan Museum, Ann Arbor, and the Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico.

MEXICO. — **NAYARIT.** San Blas, 5 m. E., 2 ♂, 2 ♀, vii.31.62, JRZ (NMSU).

LACCOPHILUS QUADRILINEATUS

This is the largest species of North American *Laccophilus*. It was described by Horn in 1871 from Texas. It is a highly variable species and, as interpreted in this paper, has a range that covers most of the central and south Plains, the Southwest, and much of Mexico. It is a polytypic species with three races that are, apparently, completely allopatric from one another. For this reason, it could easily be interpreted as three species instead of one. The species is closely related to *L. inagua* Young (1963) from the Bahamas. This suggests that additional collecting should turn up other populations through the West Indies. It is also very closely related to *L. sonorensis* n. sp. from the southwestern United States, Chihuahua, Sonora, and Baja California.

This species group is sufficiently different in size, shape, pattern and several anatomical characters from all other North American *Laccophilus* to pose a problem as to its origin and as to which group of species it belongs.

DESCRIPTION. — Large (length, 4.9 to 6.7 mm; width, 2.6 to 3.8 mm), brown and yellow, or black and yellow, variegated, vittate, or marmorated species; metacoxal file absent; prosternal process short; ovipositor rakelike. COLOR. *Head*: pale brownish-yellow or brownish-red; specimens from southern Mexico with dark reddish-brown occiput. *Pronotum*: same color as head, but *mayae* with irregular, laterally elongated darker reddish-brown discal mark in some specimens. *Elytra*: varying in the different races from a dark blotch with four anterior extensions on a pale yellow background to generally dark brown with a few discrete yellow markings; dark color may be solid or marmorated; epipleura always pale anteriorly, but may be dark or pale posteriorly. *Tergite VIII*: brown or dark brown at base, but may be pale yellow brown to brown along the posterior margin. *Venter*: variable from pale brownish-yellow, especially the pro- and mesolegs, to frequently dark reddish-brown on the metacoxal plates and the abdominal sternites. *Genitalia*: variable from pale brownish-

Table 16. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus quadrilineatus*.

Locality		N	length		elytral length		width		pronotal width		PW/EL	t_{95}
Laccophilus q. quadrilineatus												
Central Kansas	♂	10	5.81	0.194	4.51	0.169	3.08	0.110	2.38	0.095	0.529	0.0084
	♀	7	6.02	0.168	4.75	0.183	3.21	0.108	2.47	0.088	0.521	0.0052
Kay Co.,	♂	13	5.76	0.200	4.55	0.155	3.05	0.119	2.37	0.094	0.520	0.0048
Oklahoma	♀	5	5.91	0.129	4.72	0.135	3.16	0.155	2.45	0.059	0.518	0.0150
Central Texas	♂	10	5.44	0.198	4.36	0.196	2.94	0.157	2.29	0.103	0.527	0.0090
	♀	6	5.87	0.215	4.67	0.177	3.16	0.140	2.44	0.079	0.522	0.0051
South Texas	♂	14	5.55	0.099	4.47	0.100	3.00	0.078	2.36	0.048	0.529	0.0053
	♀	14	5.92	0.180	4.78	0.145	3.20	0.119	2.48	0.119	0.519	0.0051
Brewster Co.,	♂	12	5.71	0.308	4.50	0.235	3.00	0.164	2.36	0.164	0.524	0.0071
Texas	♀	17	5.90	0.183	4.65	0.152	3.11	0.120	2.44	0.090	0.525	0.0032
Dona Ana Co.,	♂	34	5.78	0.204	4.57	0.142	3.01	0.100	2.39	0.079	0.522	0.0043
New Mexico	♀	37	6.08	0.146	4.79	0.133	3.17	0.087	2.50	0.065	0.521	0.0022
Hidalgo Co.,	♂	21	5.84	0.133	4.59	0.129	3.08	0.086	2.40	0.075	0.522	0.0037
New Mexico	♀	15	5.99	0.233	4.77	0.191	3.17	0.122	2.49	0.112	0.523	0.0035
Pima Co.,	♂	6	5.67	0.151	4.45	0.111	2.94	0.103	2.32	0.062	0.521	0.0067
Arizona	♀	3	6.08	.....	4.79	.....	2.47	.....	2.47	.....	0.515	.....
Laccophilus q. tehuanensis												
Tehuantepec,	♂	48	6.05	0.190	4.77	0.137	3.34	0.113	2.56	0.083	0.538	0.0023
Oaxaca	♀	56	6.28	0.208	4.98	0.184	3.47	0.146	2.63	0.101	0.528	0.0022
Laccophilus q. mayae												
Progreso,	♂	42	5.50	0.186	4.29	0.161	2.91	0.118	2.31	0.080	0.539	0.0027
Yucatan	♀	64	5.80	0.170	4.53	0.126	3.09	0.096	2.41	0.063	0.531	0.0031

yellow to dark reddish-brown. ANATOMY. *Microreticulation*: weakly double on head and pronotum with inner cellules nearly as distinct as secondary network; elytra single, and more pebbled, especially females. *Head*: supraclypeal seam deeply impressed and closely parallel to the margin. *Pronotum*: mid-discal depression longitudinally elongate instead of round as in most of the North American species of the genus; posterior margin sharply deflected forming a more acute apical angle than is common in the genus; WH/PW, 0.68 to 0.69; LP/PW, 0.41 to 0.42. *Elytra*: apices somewhat truncated; epipleura of females with anterior wide portion extending posteriorly as far as the third abdominal segment instead of the first as in most of the genus; flange present in *tehuanensis* females. *Venter*: prosternal process broad and with raised median crest; postcoxal processes laterally projecting slightly beyond the midline; last visible segment in both sexes not truncated; apex produced in male; crest in both sexes poorly defined; viewed ventrally in both sexes the lateral sides of the segment slope sharply upward causing the posterior margin to be less rounded and more angular; apex of females reflected ventrally; weak marginate groove in females; numerous rugae and setigerous punctures scattered over surface. *Legs*: pro- and mesotarsi enlarged in a dorsoventral plane and also slightly dilated laterally; fifth protarsal segment twice as long as corresponding fourth and fifth mesotarsal segment more than twice as long as corresponding fourth; palettes easily visible at 20 power magnification; pro- and mesofemoral marginal setae very long (at least as long as femur is wide); those on profemur (usually 6) shorter and finer than those on mesofemur (usually 7). *Genitalia*: oval plate with elongated tip; its ventral crest distinct only near apex; numerous fine raised lines on either side of crest; aedeagus wider in distal than basal half, but narrows near apex to a small slightly bent tip; parameres of nearly equal length; right one with elongated apex; ovipositor more rakelike than sawlike, with about 11 pair of teeth.

Laccophilus quadrilineatus quadrilineatus Horn, new status
(Figs. 192-198, 306, 307)

Laccophilus quadrilineatus Horn, 1871, p. 330. *Lectotype*: female, Academy of Natural Sciences, Philadelphia, no. 2962, Texas; Crotch, 1873, p. 400; Sharp, 1882a, p. 294; Leng, 1920, p. 77; Zimmermann, 1920, p. 25; Leech and Chandler, 1956; Young, 1963, p. 1.

DIAGNOSIS. — Size, shape, and elytral pattern make this one of the most distinctive members of *Laccophilus*. The same statement applies to other races of *quadrilineatus*. In the United States and northern Mexico where this race occurs, this and *L. sonorensis* are the only large, non-irrorated species without a coxal file in the male and without a sawlike ovipositor in the female. Figures 306 and 307 will permit easy separation of the race from other races and similar species.

NOMENCLATURAL NOTES. — No individual specimen was selected by Horn from those he examined for his description of the

species. A female lectotype was designated. In this species the markings and other anatomical features, especially the female epipleura, make it as reliable for a type as the male. Texas was given as the locality, which does not seem to include more than one race and no intergrade zones. The type locality is here restricted to Bexar County, Texas.

VARIATION. — The degree to which the pattern covers the elytra varies greatly. The blotch of dark pigment may be extensive, covering almost half the surface of the elytra or may be reduced to a restricted area without connection with the anterior extensions. The latter condition is restricted to specimens from southern New Mexico and Arizona. It may represent a racial difference, but specimens from California are extremely similar to those from south and central Texas. At this time it seems better not to describe the variation as new until the limits and nature of it is better understood.

Females are larger than males (fig. 20). The average length for females is 5.99 mm and for males 5.72 mm. The largest female is about 6.4 mm long as compared to the largest male, which is 6.25 mm. The shortest male is about 4.9 mm and the shortest female is 5.4 mm (Table 16).

There is no general geographical trend in size, but the populations from south and central Texas appear to be somewhat smaller than those from the rest of the range. The two samples from southwestern New Mexico and Pima County, Arizona, which overlap the range of *L. sonorensis*, give mean values for all four measurements that are as large as any sample of *q. quadrilineatus*. Hence there is no evidence of intergradation between these two, based upon quantitative characters.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. q. quadrilineatus* ranges throughout the Plains from northeastern Kansas and east central Colorado south to northern Mexico in Nuevo Leon, Coahuila, and Chihuahua, and west to Los Angeles, California (fig. 19). It appears to be limited by woodland on the east, and by mountains in the south and southwest. It is sympatric with *L. sonorensis* from southcentral New Mexico to Blythe, California. The large gaps in north Texas and southwestern Arizona are probably due to lack of collecting, since all *Laccophilus* species from those areas are poorly represented in collections.

The species prefers temporary aquatic situations that frequently have alkaline or salty water with mud bottoms and little or no vegetation. In some seasons probably, it is the most common *Laccophilus* in stock ponds in the Southwest. While usually not found in the mountains, it has been taken as high as 8000 feet in Lincoln County, New Mexico. One of the best localities to collect this species, and *L. sonorensis,* is in the heavily alkaline playa near Interstate 10 in Hidalgo County, New Mexico. Obviously, the species can tolerate high temperatures and can fly long distances from one drying puddle to another.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ARIZONA.** *Cochise County.* Chiracahua Mtns., Cave Ck. Can., 1 ♀, ix.13-14.52, B. Malkin (FM). Tombstone, 5 m. N., 4 ♂, 1 ♀, ix.6.61; Huachucha City, 2 ♀, ix.6.61; Rodeo (N.M.), 2 m. NW., 5 ♂, 2 ♀, ix.5.61, JRZ (NMSU). **CALIFORNIA.** *Imperial County.* Brawley, 1, viii.8.14, J. C. Bradley (CNL). Calexico, 3, viii.24.37; El Centro, 1, —.—.37, H. B. Leech (CAS). County, 1 ♂, viii.27.—, Blaisdell (CAS). *Los Angeles County.* Los Angeles, 1 ♀, vi.16.25 (BERK). *Riverside County.* Blythe, 8, vii.10.47, J. W. MacSwain (CAS); 1, viii.6.47, J. W. MacSwain (BERK). *San Bernardino County.* Colton, 1, Chittenden (USNM). **COLORADO.** *Kiowa County.* Eads, 8 m. S., 2 ♀, ix.11.63, K. L. McWilliams (NMSU). *Lincoln County.* Hugo, 8 m. SE., 2 ♂, 1 ♀, ix.11.63, K. L. McWilliams (NMSU). **KANSAS.** *Harvey County.* County, 1, Popenoe (USNM). Newton, 5 m. E., 1 ♀, vii.6.60; near Sedgwick, 1 ♀, vii.13.60, JRZ (NMSU). *McPherson County.* McPherson, 8, viii.29.— (USNM); 3 ♂, 5 ♀, vi.20.—, W. Knaus; 3 ♂, 5 ♀, viii.29.—, W. Knaus (AMNH); 1 ♂, vi.4.— (MCZ). *Marion County.* Marion, 2.5 m. NW., 1 ♀, viii.9.60, JRZ (NMSU). *Pottawatomie County.* Onaga, 1 (USNM). *Reno County.* County, 2, ix.21.11, Blaisdell (CAS). Haven, 8 m. E., 4 ♂, 1 ♀, vii.13.60, JRZ (NMSU). *Sedgwick County.* Wichita, 1 ♀, JRZ (NMSU). *Stafford County.* Salt Flats Area, 2, vii.11.57, H. & M. Evans (CNL); 1 ♀, same data (CAS). **NEW MEXICO.** *Chaves County.* Dexter, 5 m. S., 1 ♀, vii.27.65, A. H. Smith (NMSU). *Dona Ana County.* Las Cruces, 1 ♀, vii.5.61; 1 ♂, vii.6.61; 4 ♂, 3 ♀, vii.10.61, JRZ (NMSU). Jornada Range, Taylor Wells, 19 ♂, 29 ♀, vii.28.63, K. L. McWilliams; 14 ♂, 12 ♀, vii.20.63, K. L. McWilliams (NMSU). Mesilla, 1 m. SW., 1 ♂, viii.1.61, JRZ (NMSU). *Guadalupe County.* Santa Rosa, 5 m. NE., 1 ♂, 1 ♀, ix.10.63, K. L. McWilliams (NMSU). *Hidalgo County.* Animas, 1 m. S., 3 ♂, 4 ♀, vii.31.65, H. B. Leech (CAS). *Lincoln County.* Alto, 1 ♀, vii.27.61, JRZ (NMSU). Carrizozo, 13 m. NE., 1 ♂, 3 ♀, K. L. McWilliams (NMSU). *Luna County.* Columbus, 1 m. S., 1 ♀, vii.17.61, JRZ (NMSU). Deming, 1, —.22.07, Hubbard & Schwarz (USNM). Hurley, 1 ♀, vii.17.61, JRZ (NMSU). *Otero County.* Pinon, 40 m. S., 3 ♂,

3 ♀, vii.29.63, R. D. Ohmart (NMSU). *Socorro County*. Near Bingham, 1 ♂, vii.21.62, R. D. Ohmart (NMSU). *Quay County*. San Jon, 1 ♂, 1 ♀, ix.10.63, K. L. McWilliams (NMSU). **OKLAHOMA**. *Kay County*. Blackwell, 2 m. NW., 3 ♂, vi.30.60; Braman, 2 m. NW., 2 ♂, 4 ♀, vi.28.60; 8 m. N., 1 ♂, 1 ♀, vi.20.60; Tonkawa, 4 m. NW., 8 ♂, vi.30.60, JRZ (NMSU). *Logan County*. Guthrie, 1, vi.23.11, Kaeber (USNM). *Marshall County*. 1 (USNM). *Texas County*. Hooker, 7 m. SW., 1 ♂, ix.11.63; Guymon, 1 ♀, ix.11.63, K. L. McWilliams (NMSU). **TEXAS**. *Bexar County*. Leon Ck., 3 ♂, 1 ♀, x.11.52; 1 ♂, x.12.52; Fort Sam Houston, 2 ♀, vi.—.52, B. J. Adelson (CAS). *Blanco County*. Shovel Mtn., 2 ♂, 1 ♀, F. G. Schaupp (AMNH). *Brewster County*. Marathon, 22 m. S., 1 ♂, ix.3.60, L. A. Stange (DAV). Boquillas, BBNP, 13 ♂, 17 ♀, viii.2.61, JRZ (NMSU). *Burnet County*. County, 3, Hubbard & Schwarz (USNM). *Cameron County*. Brownsville, Esperanza Ranch, 2, viii.14.— (USNM); 1, viii.14.28, L. A. Sayon (USNM); 1, H. S. Barber (USNM); 3, ix.27.42, E. S. Ross (CAS); 1 (CNL). Port Isabel, 14, x.20.49, O. Bryant (CAS). *Dimmit County*. Caterina, 1, vii.7.48, F. Werner & W. Nutting (ARI). *El Paso County*. Clint, 1 m. S., 1 ♀, vii.19.61, JRZ (NMSU). *Hidalgo County*. Texas Exp. Sta., light trap, 2 ♂, 1 ♀, v.29.30; 1, v.30.30; 1, v.20.30, J. C. Gaines (TAM). *J. Davis County*. Davis Mtns., Limpia Canyon, 1 ♂, 1 ♀, vii.2.47, B. Malkin (FM). Ft. Davis, 1 ♂, vii.8.64, Arnett & Van Tassel (CUA). *Kleburg County*. Kingsville, 3 (USNM); 7, C. T. Reed (CNL). Riviera, 3.5 m. N., 1 ♀, vi.29.61, R. L. Westcott (LACM). *Lee County*. 2 (USNM); Fedor, 4 ♂, 4 ♀ (CNG). *Nueces County*. Corpus Christi, 3, vi.10.47, A. Fenyes (CAS). *Presidio County*. Marfa, 14 m. N., 3 ♀, viii.1.61, JRZ (NMSU). *Starr County*. Rio Grande City, 15 m. NE., 1 ♂, 1 ♀, iii.3.54, H. F. Howden (USNM). *Uvalde County*. Uvalde, 1, v.21.38, S. E. Jones (TAM). *Victoria County*. Victoria, 1 ♀, ix.—.— (USNM). *Webb County*. Laredo, 1 ♂, vii.2.47, B. Malkin (FM).

MEXICO. — **CHIHUAHUA**. Camargo, 1 ♂, 1 ♀, viii.8.53, R. & J. Selander (CAS); 1 m. N., 1 ♂, vii.25.62, JRZ (NMSU). **COAHUILA**. Villa Acuna, San Lorenzo Rnch., 1 ♂, vi.16.38, R. H. Baker (TAM). Ramos Arizpe, 1 ♂, vii.7.63, JRZ (NMSU). **NUEVO LEON**. Monterrey, 1 ♀, x.—.59 (NMSU). Vallecillo, 3 ♂, 3 ♀, vi.2-5.51, P. Hurd (BERK).

Laccophilus quadrilineatus tehuanensis, new subspecies (Fig. 309)

DIAGNOSIS AND DESCRIPTION. — *L. q. tehuanensis* differs from other subspecies of *quadrilineatus* in its larger size (Table 17; fig. 19), its nearly black elytral pattern, the frequent occurrence of a female epipleural flange, and the shape of the aedeagus. It differs from typical *quadrilineatus* in that the elytral pattern is usually more extensive, with the anterior extensions or "fingers" widening so that they frequently merge instead of remaining discrete. The rest of the exoskeleton is darker also, especially on the head and venter. The lateral margins of the metacoxal plates and the area around the bases of the coxae are dark brown or nearly black. The elytral pattern of *mayae* is usually more

extensive, reddish-brown, and somewhat marmorated. The pronotum is relatively longer in *tehuanensis* than in *quadrilineatus* or in *mayae* (2.43 times as wide as long as compared to 2.33-2.40). The most posterior mesotibial spur is both relatively and absolutely longer in *tehuanensis*. It is more than twice as long as the one next to it, while it is less than twice as long in the other two subspecies.

VARIATION. — Females average about 0.2 mm longer than males. The largest female is nearly 6.6 mm long (n = 56) and the largest male about 6.4 mm (n = 48). The smallest female measured about 0.1 mm smaller than the smallest male, however (5.6 and 5.7 mm).

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This race is known from three localities on the southern side of the Isthmus of Tehuantepec and from one specimen taken at Mazatlan, Sinaloa. It was taken on the coastal lowland in roadside ditch ponds that had muddy bottoms and highly turbid water. There was no appreciable vegetation except some algal filaments.

MATERIAL EXAMINED

Holotype male, *allotype* female, four paratypes with the following locality data are in the United States National Museum. Tehuantepec, Oaxaca, ix.2.63, J. R. Zimmerman. Two paratypes of each sex with the same data are also in the California Academy of Sciences, San Francisco, and the Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico. A female paratype from 2 m. W. of Tehuantepec, Oaxaca and a male and female paratype with same data as the holotype, vi.20.58, J. C. Schaffner, are in the University of Michigan Museum of Zoology, Ann Arbor, and another female paratype from Mazatlan, Sinaloa, viii.2.53, C. and P. Vaurie, is in the American Museum of Natural History, New York.

MEXICO. — **OAXACA.** Tehuantepec, 46 ♂, 49 ♀, ix.2.63; Juchitan, 3 m. E., 8 ♂, 10 ♀, ix.7.63, JRZ (NMSU).

Laccophilus quadrilineatus mayae, new subspecies (Fig. 310)

DIAGNOSIS AND DESCRIPTION. — *L. q. mayae* differs from other subspecies of *quadrilineatus* in its extensive dark reddish-brown elytral pattern and in the laterally elongated darkened area on the pronotum. The pattern is lighter than that of *tehuanensis*, but the remainder of the exoskeleton has about the same dark yellowish-brown to brown tones. In all features it is much darker than *quadrilineatus*. The proportions of the pronotum are the same as those of that race (2.33 to 2.40 times wider than long), but relatively shorter than that of *tehuanensis* (2.43). The hind margins of the postcoxal processes form almost a right angle to the midline in *mayae* — instead of an obtuse angle or

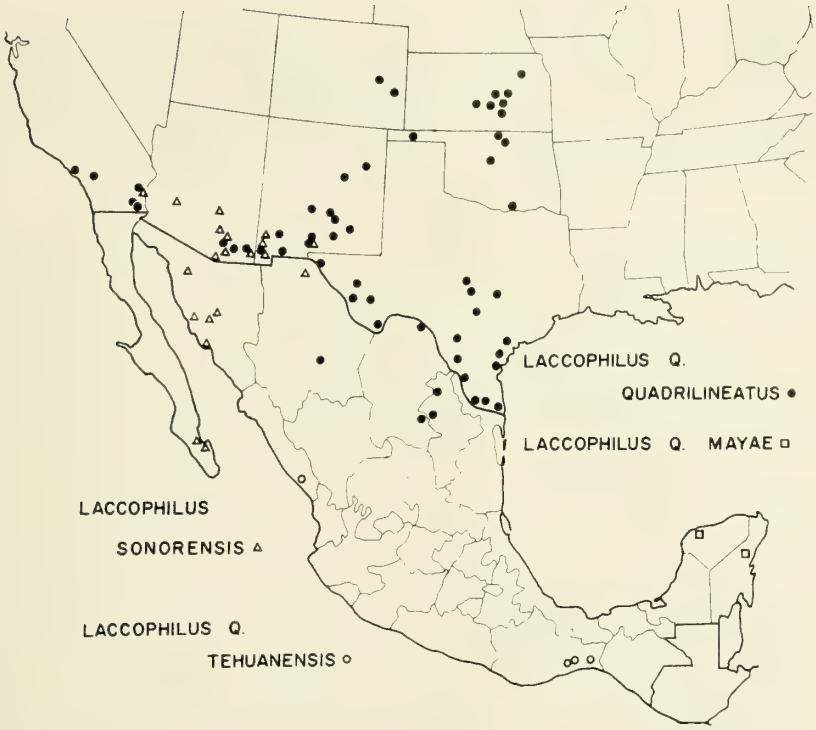

Figure 19. Distribution of *Laccophilus quadrilineatus* and *L. sonorensis.*

an undulating margin as in the other two subspecies. *L. q. mayae* differs from *L. inagua* only in its smaller size (females average 5.80 as compared to 6.75; n = 7), in the less extensive elytral pattern, and in the detailed structure of the aedeagus. In all other features, the two are extremely similar.

VARIATION. — Females are larger than males (Table 17). The largest female is about 6.3 mm long and the largest male about 5.8 mm. The smallest female is slightly more than 5.4 mm and the smallest male is under 5.1 mm (fig. 19). Males may be slightly wider than females, however. The PW/EL ratios are 0.539 for males and 0.531 for females with no overlapping at the 95 percent confidence interval, indicating that males may be slightly broader than females.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This subspecies is known from but two localities on the Yucatan Peninsula. More than a hundred specimens were taken in a single collection near Progreso, Yucatan, in a roadside puddle that may have

been brackish water. The bottom was bedrock limestone. The water was dark and extremely turbid and filled with debris. Both along the edges and in the middle, there was considerable emergent vegetation.

The second locality is given as Touleum, Quintana Roo. This probably is the archeological site of Tulum on the east coast.

MATERIAL EXAMINED

Holotype male, *allotype* female, and five male and five female paratypes with the following locality data are in the United States National Museum: 5 miles south of Progreso, Yucatan, xi.24.63, J. R. Zimmerman. Two paratypes of each sex with same data are also in the California Academy of Sciences, San Francisco, and the Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, Mexico. A male paratype from Touleum, Quintana Roo, viii.12.49, C. J. Goodnight, is also in the University of Michigan Museum of Zoology, Ann Arbor.

MEXICO. — **YUCATAN.** Progreso, 5 m. S., 36 ♂, 55 ♀, xi.24.63, JRZ (NMSU).

Laccophilus sonorensis, new species (Fig. 308)

DIAGNOSIS. — A comparison of elytral patterns will permit separation of *sonorensis* from all other species. It most resembles the sympatric *L. q. quadrilineatus,* but the pattern is almost a "negative" of that form. Anatomically, the two are extremely similar and, obviously, closely related. The postcoxal processes of *quadrilineatus* appear to project slightly more posteriorly than they do in *sonorensis,* however. Megascopically, *sonorensis* might be mistaken for the more common *L. fasciatus terminalis,* but a microscopic examination will readily show the differences. *L. vacaensis thermophilus* occurs in the same area and, like *sonorensis,* lacks a metacoxal file in the male and has widespread teeth on the ovipositor; but it is an irrorated species with a different elytral pattern and is generally much smaller. No other sympatric *Laccophilus* species would be confused with *sonorensis.*

DESCRIPTION. — Medium to large (length, 4.5 to 6.0 mm; width, 2.5 to 3.2 mm), yellow and brown, non-irrorated species; metacoxal file absent; prosternal process short; ovipositor more rakelike than sawlike. COLOR. *Head* and *pronotum*: pale yellow, faded near margins. *Elytra*: yellow with brown markings; elytral suture dark reddish-brown; epipleura pale anteriorly and sometimes darkened to translucent reddish-brown posteriorly. *Tergite VIII*: brown at base, but posterior half yellow. *Venter* and *genitalia*: pale yellow tinged with reddish-brown. ANATOMY. *Microreticulation*: weakly double on head and pronotum with inner cellules nearly as distinct as secondary network; elytra single and more pebbled, especially females. *Head*: supraclypeal seam deeply impressed and closely parallel to the margin. *Pronotum*: mid-discal depression longitudinally elongate; WH/PW, 0.69; LP/PW, 0.42; posterior mar-

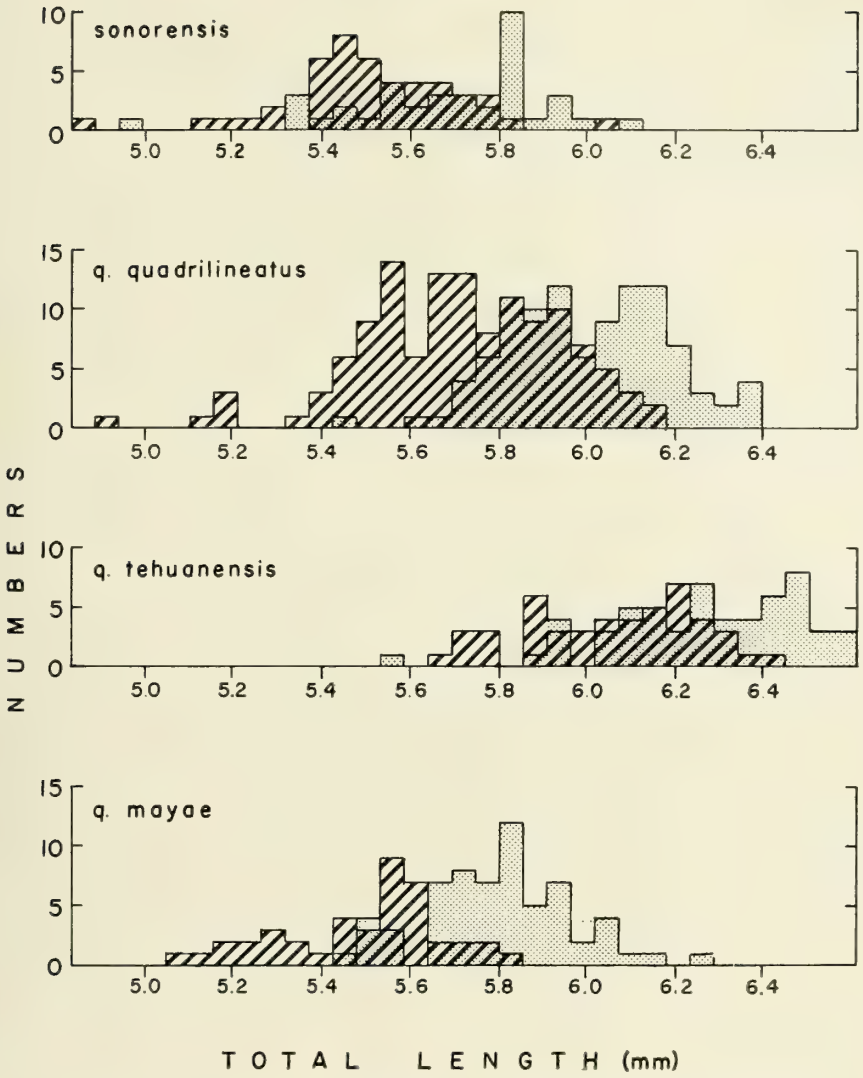

Figure 20. Histograms of length in *Laccophilus quadrilineatus* and *L. sonorensis*. Males are shown crosshatched; females, stippled.

gin sharply deflected forming a more acute apical angle than is common in the genus. *Elytra*: apices somewhat truncated; epipleura of females with anterior wide portion extending and widening posteriorly as far as the third abdominal segment instead of constricting at about the first as in most of the genus. *Venter*: prosternal process short and broad with raised median crest; postcoxal processes projecting only slightly beyond the midline; outline of last ventral seg-

Table 17. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus sonorensis*.

Locality		N	length		elytral length		width		pronotal width		PW/EL	t_{95}
Hidalgo Co.,	♂	30	5.12	0.141	4.28	0.115	2.85	0.099	2.27	0.062	0.530	0.0027
New Mexico	♀	27	5.66	0.179	4.42	0.157	2.95	0.125	2.35	0.087	0.530	0.0049
Pima Co.,	♂	4	5.28	0.300	4.08	0.243	2.82	0.135	2.15	0.120	0.527	0.0199
Arizona	♀	3	5.34	.....	4.22	.....	2.75	.....	2.18	.....	0.517	.....
La Paz,	♂	8	5.70	0.248	4.43	0.145	2.92	0.123	2.38	0.100	0.536	0.0059
Baja California	♀	3	5.87	.....	4.60	.....	3.04	.....	2.43	.....	0.528	.....

ment subtriangular with rounded crest in females; more rounded with produced apex in males; an asymmetrical curving crest present; lateral surfaces of last segment in both sexes sloping rather sharply upward when viewed ventrally causing the posterior margin to be less rounded and more angular; apex of female segment reflexed ventrally; a few rugae and numerous setigerous punctures accumulating toward posterior margin. *Legs*: pro- and mesotarsi enlarged in a dorsoventral plane and dilated slightly laterally; fifth protarsal segment at least twice as long as corresponding fourth and fifth mesotarsal segment slightly more than twice as long as corresponding fourth; palettes easily visible at 20 power magnification; pro- and mesofemoral marginal setae very long (some at least as long as femur is wide); profemoral ones (6 to 7) shorter and finer than mesofemoral ones (7 or 8). *Genitalia*: oval plate with elongated tip; its ventral crest distinct only near apex; numerous fine raised lines on either side of crest; aedeagus wider in distal than in basal half, but narrowing near apex to a small slightly bent and rounded tip; parameres of nearly equal length; right one with elongated apex; ovipositor with about 11 pair of widely spaced, but triangular teeth.

NOMENCLATURAL NOTES. — It is obvious that *sonorensis* is closely related to *L. q. quadrilineatus*. Anatomically, they are virtually identical; but the elytral patterns and size are different (Table 16, 17). *L. sonorensis* males are about 0.45 mm smaller than *quadrilineatus* males, and the females are 0.3 mm smaller than the latter (fig. 20). In the absence of intergrades and with a considerable area of overlap, it seems necessary at the present time to consider the two as distinct.

VARIATION. — Males are smaller than females, but the smallest individual from a sample of about 85 specimens was a female which measured only 4.97 mm long. The next smallest individuals were two males that measured 5.18 mm. Also, the largest male was as large as the largest female (about 6.05 mm long). The population from La Paz, Baja California, may be larger than those from Sonora, Arizona, and New Mexico; but the samples are too small to give conclusive results (Table 17). There seems to be no difference between the elytral patterns of males and females. The elytra have a discal blotch that has a variable amount of clearing in the center and is extended anteriorly in fingerlike projections similar to that of *quadrilineatus*. The degree to which the projections are joined to the blotch varies from extensive to almost none.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — The northern limit of this species is confined to southern New

Mexico and Arizona (fig. 19). The easternmost records are in Dona Ana County, New Mexico, and Samalayuca, Chihuahua, which lies about 30 miles south of El Paso, Texas. The northwestern record is Mono County, California; and in Sonora, it has been taken about as far south as Hermosillo. It has been collected on two occasions near La Paz, Baja California, but nothing is known about its distribution farther north on the peninsula. The gap in southwestern Arizona is due to a lack of good collections from that area.

This species, which occurs in the same ponds as *quadrilineatus*, seems to prefer temporary situations in the flat areas between the isolated ranges in the southwestern United States and northern Mexico. It is a desert species that can, apparently, tolerate the high water temperatures that must frequently occur. It must be highly mobile and readily fly from one drying puddle to another which may be 20 or more miles distant.

MATERIAL EXAMINED

Holotype male, *allotype* female, and five paratypes with the following data are in the California Academy of Sciences, San Francisco: La Paz, Baja California Sur, viii.28.60, A. G. Smith. Two more males and one female paratypes (8.2 m. W. of La Paz, Baja California Sur, xii.31.58, H. B. Leech) are also in the California Academy of Sciences. A male and female paratype from 5 miles south of Animas, Hidalgo County, vii.24.61, J. R. Zimmerman, are in each of the following: the United States National Museum, the University of Michigan Museum of Zoology, Ann Arbor, and the Departmento de Entomologia, Laboratorio de Vegetal Sanidad, Coyoacan, D. F., Mexico.

UNITED STATES OF AMERICA. — **ARIZONA.** *Cochise County.* Huachucha City, 2 ♂, 1 ♀, ix.6.61 (NMSU). Tombstone, 5 m. N., 1 ♀, ix.6.61; Rodeo (N.M.), 2 m. NW., 4 ♂, 4 ♀, ix.5.61, JRZ (NMSU). *Maricopa County.* Gillespie Dam, 1 ♀, viii.18.64, Arnett & Van Tassel (CUA). *Pima County.* Tucson, 1 ♂, ix.—.33, O. Bryant (CAS). *Pinal County.* Superior, 1 ♂, vii.15.27, E. G. Graham (CNL). Picacho Pass, 1 ♀, ix.12.54, J. C. Hall (DAV). *Santa Cruz County.* Pena Blanca, 1 ♂, viii.9.61; 1 ♀, viii.5.62, Arnett & Van Tassel (CUA). **CALIFORNIA.** *Mono County.* Mammoth, 2 ♂, viii.17.52, P. S. Bartholomew (CAS). *Riverside County.* Blythe, 1 ♀, vi.7.62, R. M. Hardman (BERK). **NEW MEXICO.** *Dona Ana County.* Jornada Range, Taylor Wells, 1 ♂, vii.20.63; 3 ♂, vii.28.63, K. L. McWilliams (NMSU). *Hidalgo County.* Animas, 5 m. S., 14 ♂, 12 ♀, vii.24.61, JRZ (NMSU); 1 m. S., 1 ♂, 1 ♀, vii.31.65, H. B. Leech (CAS). Gary, 5 m. W., 8 ♂, 7 ♀, vii.24.61; Roadforks, 4 ♂, 2 ♀, ix.5.61, JRZ (NMSU). Double Adobe Ranch, Animas Mtns., 2 ♀, viii.15.52, H. B. Leech (CAS).

Figure 21. Distribution of *Laccophilus biguttatus, L. undatus,* and *L. schwarzi.*

MEXICO. — **BAJA CALIFORNIA SUR.** La Paz, 7 ♂, 2 ♀, viii.28.60, A. G. Smith; 8.2 m. W., 2 ♂, 1 ♀, xii.31.58, H. B. Leech (CAS). **CHIHUAHUA.** Samalayuca, 1 ♀, viii.6.50, R. F. Smith (AMNH). **SONORA.** Hermosillo, 1 ♀, viii.15-20.53; 50 km. W., Rancho San Francisco, 3 ♀, viii.2.53, B. Malkin; San Carlos Bay, 1 ♂, viii.10.60, Arnaud, Ross, & Rentz; Rancho Montijo, 25 m. E. Puerto Kino, 1 ♀, viii.1.50, J. Figg-Hoblyn (CAS).

Laccophilus biguttatus Kirby (Figs. 201-208, 321)

Laccophilus biguttatus Kirby, 1837, p. 69. *Type*: British Museum (Natural History), Boreal America; Leng, 1920, p. 77; Zimmermann, 1920, p. 25; Balfour-Browne, J., 1944, p. 345; Blackwelder and Blackwelder, 1948, p. 3.

Laccophilus inconspicuus Fall, 1917, p. 164; Leng, 1920, p. 76; Zimmermann, 1920, p. 25.

DIAGNOSIS. — This is the only *Laccophilus* occurring in North America with a pale unicolorous or concolorous elytra. All others are irrorated, variegated, marmorated or spotted, or much darker. It resembles *L. mexicanus,* an irrorated species, but lacks a file in the male. *L. biguttatus* also his thickened, darkened antennal segments, a character possessed as well by the strongly patterned *undatus.*

DESCRIPTION. — Medium (length, 3.9 to 4.8 mm; width, 2.3 to 2.6 mm), concolorous, brownish-yellow, non-irrorated species; metacoxal file absent, prosternal process short; ovipositor sawlike. COLOR. *Head*: generally brownish-yellow above and beneath, but darker on occiput, brownish on tips of maxillary and labial palpi and on the distal halves of the last seven antennal segments.

Pronotum: about the same as head and with a darker area on the anterior margin corresponding to the one on the head. *Elytra*: generally unicolorous light brownish-yellow to light brown; some suggestion of pattern along the anterior half of the lateral margins, subbasally, and just behind the middle; epipleura entirely pale. *Tergite VIII*: light to medium brown. *Venter*: variable from entirely brownish-yellow to nearly reddish-black or black; legs usually remain pale yellowish-brown tinged with red. *Genitalia*: variable in the same fashion as the venter. ANATOMY. *Microreticulation*: faintly double on the head and pronotum, but individual cellules strongly impressed; single on the elytra; surface shining. *Head*: antennal joints thicker than other North American *Laccophilus*; supraclypeal seam parallel, but separated somewhat from the margin. *Pronotum*: WH/PW, 0.68; LP/PW, 0.40. *Elytra*: apices slightly truncated; female epipleura without flange. *Venter*: prosternal process with well-defined crest from base to apex; postcoxal processes rounded and laterally projecting well posterior to midline; last ventral abdominal segments in both sexes neither produced nor truncated; median crest on female segment marked and rooflike at apex; male crest nearly symmetrical so that the outline is similar in the two sexes; scattered setigerous punctures. *Legs*: male pro- and mesotarsi enlarged slightly in a dorsoventral plane; palettes easily visible at 20 power magnification; fifth tarsal segment on both pair of front legs about one and three-fifths as long as corresponding fourth; setae on profemoral margin (7 or 8) similar in diameter, length and number to mesofemoral ones. *Genitalia*: oval plate produced to point; its median crest with leftward curvature; somewhat stronger than the raised lines which are present on either side; aedeagus strongly curved at about half its length, expanding before the apex, but narrowing near tip; setae projecting from apex of right paramere instead of subapically as in most members of the genus; ovipositor with about 15 sawlike teeth on each row.

NOMENCLATURAL NOTES. — The *biguttatus* of Kirby (1837) was long unrecognized and was ascribed to *fasciatus* or *proximus*. Sharp's (1882a) monograph does not include the species. Fall's *inconspicuus* was recognized as a synonym by J. Balfour-Browne (1944); and, at the same time, its identity was clarified. Kirby's description noted the darkened antennal segments and palpi; but his references to spots (that are weak at best and, perhaps, partly due to translucence) delayed the recognition of this distinctive species.

L. biguttatus is strongly similar to *L. minutus* (L.) of the Old World, as noted by Kirby, and, eventually, may prove to be a race of an extremely widespread polytypic species. The genitalia, thickened and darkened antennae, lack of file, microreticulation, size, and shape are all close; and only the elytral pattern differs. The last is a feature that varies considerably in other races of several North American species.

Table 18. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus biguttatus*.

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
New Hampshire	♂	3	4.16	.....	3.27	.....	.....	2.36	.....	1.84	.....	0.565	.....
	♀	4	4.56	0.488(3)	3.64	.....	(3)	2.65	.....	2.07	.....	0.569	.....
Manitoba	♂	21	4.30	0.115	3.36	0.092	.....	2.45	0.062	1.97	0.051	0.586	0.0062
	♀	18	4.39	0.107	3.40	0.084	.....	2.45	0.059	1.99	0.056	0.587	0.0088
Saskatchewan	♂	3	4.23	.....	3.31	.....	(2)	2.36	.....	1.89	.....	0.571	.....
Alberta	♂	31	4.26	0.134	3.36	0.125	.....	2.46	0.079	1.93	0.067	0.574	0.0072
	♀	28	4.36	0.183	3.38	0.182	.....	2.42	0.109	1.96	0.103	0.582	0.0077
Colorado	♂	17	4.33	0.148	3.36	0.087	.....	2.39	0.068	1.91	0.053	0.568	0.0067
	♀	12	4.45	0.104	3.47	0.093	(9)	2.48	0.060	1.19	0.041	0.564	0.0088
British Columbia	♂	7	4.37	0.151	3.42	0.107	.....	2.47	0.086	1.92	0.040	0.563	0.0106
	♀	6	4.50	0.163	3.51	0.116	.....	2.49	0.086	1.96	0.047	0.560	0.0065
Yukon	♂	9	4.12	0.104	3.24	0.127	.....	2.27	0.055	1.86	0.046	0.573	0.0142
	♀	8	4.32	0.129	3.43	0.115	.....	2.40	0.040	1.92	0.028	0.562	0.0196

VARIATION. — The venter varies from pale yellowish-brown to nearly all black in some specimens. This feature is not clearly geographic, but is generally uniform for any one sample.

Females appear to be slightly larger than males, but with a large overlap (Table 18). The peak in the frequency distribution of length for females is about 4.4 mm, and that for males is about 4.25 mm (fig. 22). The largest females are slightly larger than the largest males, and the same relationship holds for the smallest of each sex as well. In samples from six different areas females always had larger values than the males from the same locality.

Quantitative comparisons of seven samples from New Hampshire to the Yukon give no indication of any racial differentiation of *biguttatus* within North America. Differences appear to be more local

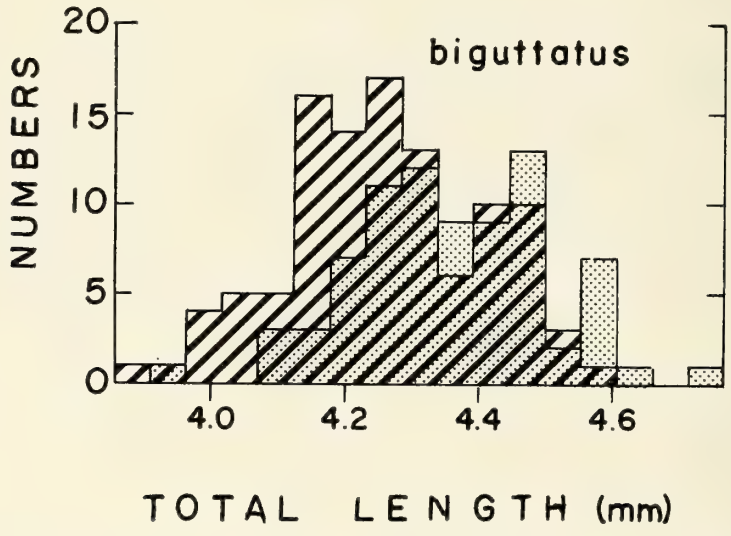

Figure 22. Histograms of length in *Laccophilus biguttatus.* Males shown in crosshatch; females, stippled.

than regional. The three largest and most reliable samples (from Manitoba, Alberta, and from Colorado) are similar. Males from the Yukon (n = 9) do appear to be smaller than all other males, except those from New Hampshire (n = 3), and may reflect the extreme environment of the northern climate.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This is the only boreal species of *Laccophilus* in North America. It occurs in all the northern tier of states and as far south as northwestern New Mexico and the Sierra Nevadas of California. It is known from all provinces from Quebec west. It is not known how far north the range extends in eastern Canada; but it does occur in the Northwest Territories, the Yukon, and Alaska (fig. 21).

L. biguttatus seems to be the commonest *Laccophilus* in the interior provinces. I have collected this species only in the Chuska Mountains of northwestern New Mexico and at an altitude of about 9000 feet. It was in mountain meadow ponds that were choked with water weed and algae, but with clear water. Fall quotes Sherman that, in New Hampshire, they are taken at higher altitudes of the White Mountains. In North Dakota, Wisconsin and Michigan, they had to be taken at much lower altitudes than the two previously cited localities.

MATERIAL EXAMINED

CANADA. — **ALBERTA.** Calgary, Calgary, 1, x.23.27, O. Bryant (CAS). Cypress Hills, 1, viii.25.27 (USNM); 1 ♀, vi.13.24 (DAV). Edmonton, 2 paratypes (*inconspicuus* Fall); 4, iv.12.17; 14, iv.22.17, F. S. Carr (USNM); 19, iv.4.18, F. S. Carr; 30, viii.19.27, O. Bryant; 4, vi.12.17, F. S. Carr (CAS). 2 ♂, 2 ♀, v.5.15; 3 ♂, iv.9.17; 2 ♂, iv.11.17; 1 ♂, v.20.17; 1 ♂, 1 ♀, iv.27.18, F. S. Carr (MCZ). High River, 1, vi.25.27, O. Bryant (CAS). Medicine Hat, 1 ♂, viii.21.23, F. S. Carr (FM); 1, vii.29.—, H. J. Rayner (CAS). Red Deer, 1, vii.19.— (USNM). Tofield, 1, x.24.24; Turner Valley, 25, v.24.29, O. Bryant (CAS). Waghorn, 10 (USNM). Wastoc, 1 ♂, x.12.21, F. S. Carr (DAV). **BRITISH COLUMBIA.** Clinton, 2, vi.18.31, R. Hopping; 2, x.11.43, H. B. Leech & C. V. Morgan; Copper Mtn., 1, v.15.43, G. S. Smith; Enderly, 1, iv.1.45, H. B. Leech; Fernie, 11, ix.16.28, O. Bryant; Lumby, 1, v.11.33, E. R. Backell (CAS). Lac Le Hache, 3 ♂, viii.—.59, J. Robertson (LACM). Nicole Lake, 1 ♂, viii.25.32, A. E. Thrupp (BERK); 3, viii.25.32, A. Thrupp; Oliver, iv.25.33, E. R. Backell (CAS). Paxton Valley, 1 ♀, vi.22.23, A. E. Thrupp (BERK); 6, vii.22.53, A. E. Thrupp (CAS); 1 ♂, vi.22.23 (LACM). Similkameen, Taylor Swamp, 2, iii.29.41, High (CNL); Similkameen, 2, iii.29.41, H. B. Leech; Upper Hat Ck., 1, viii.25.32; 1, viii.29.33, G. J. Spencer (CAS). Vernon, 2 ♂, 5 ♀, ix.2.40, H. B. Leech (LACM). **DISTRICT OF MACKENZIE.** Aklavik, 3, viii.5.30; 2, ix.5.30; Hay River, 3, ix.30.29; 16, vii.12.30, O. Bryant (CAS). **MANITOBA.** Aweme, 7, vi.16.04, Criddle; Piquitenay, 2, vii.24.17, J. B. Wallis (USNM). Stonewall, 1, v.11.24, J. B. Wallis (CNL). Treesbank, 11 ♂, 8 ♀, vii.10.25, J. B. Wallis (AMNH); 8 ♂, 12 ♀, vii.10.25 (MCZ). Winnipeg, 6, viii.16.16; 2, v.27.24, J. B. Wallis (USNM); 1, v.4.24,

J. B. Wallis (CNL); 1 ♂, ix.2.16, J. B. Wallis (CNG); 1 ♀, v.1.—; 1 ♂, 1 ♀, v.8.—, J. B. Wallis (AMNH); 1 ♂, viii.16.16, J. B. Wallis (CAS). **ONTARIO.** Nipigon, 1 ♀, viii.29.27, Darlington (MCZ). Sioux Lookout, 1 ♂, 1 ♀, ix.5.16 (CNG). **QUEBEC.** Abitibi Post, 5, vii.23.35; Duparquet, 4, viii.2.35; 3, v.15.38; 5, viii.28.39; 5, vii.21.43; 1, ix.2.43, G. Stace Smith (CAS). Montreal, 3 (USNM); 2 ♂, 2 ♀, vii.—.—, Chagnon (AMNH). Notoshquan, 1, xi.8.29, W. J. Brown (CAS). Strathcone, 1, v.—.05 (USNM). **SASKATCHEWAN.** Lost Mtn. Lake, 1, JST (CNL). Murray (Lake?), NW. of Battleford, 1, v.28.39 (CNL). Redberry Lake, 2, vi.24.39; Redvers, 2 (CNL); 1 ♂ (MCZ). Regina, 1, v.30.38, C. Shaw (CAS); 1 ♂, iv.15.44, C. C. Shaw (MCZ). Sturgeon (Lake?), 2, vi.24.39 (CNL). Yorkton, 14, vi.5.47, C. C. Shaw (CAS); 1 ♀, iv.24.45, C. C. Shaw (MCZ). **YUKON.** Mayo, 6 ♂, 5 ♀, vii.3.55, F. S. Carr (CARR).

UNITED STATES OF AMERICA. — **ALASKA.** Fairbanks, 2 ♀, viii.4.58, Lindroth (CAS); Fairbanks, Farmers' Loop, 2 ♀, viii.11.57; Glenn Hwy., Mile Post 86, 1 ♂, viii.28.57; Alaska Hwy., Mile Post 1370, 1 ♂, viii.10.57, E. L. Kessel (CAS). **CALIFORNIA.** *Tulare County.* Sequoia Natl. Park, 1 ♂, F. E. Winters (CAS). **COLORADO.** *Boulder, Grant* or *Larimer Counties.* Battle Mtn. Dam, 15, vii.17.37, E. B. Andrews (CAS). Rocky M.N.P., Glacier Basin, 2, vii.—.37, E. B. Andrews (CNL); 2, vii.1.37 (USNM); 3 ♀, vii.1.37, H. B. Leech (FM); 2 ♂, vii.1.37, J. G. Thorndike (AMNH). R.M.N.P., 8500 feet, 1, F. E. Winters (CNL); Storm Pass, 3, vii.8.38, E. B. Andrews (CAS). Glacier Basin, 2 ♂, viii.1.37, Andrews (MCZ). Rocky M.N.P., 11 ♂, 10 ♀, F. E. Winters (CAS). *Jackson County.* Cameron Pass, 15, viii.19.41, H. P. Chandler (CAS). Muddy Pass Jct., Hwy. 40, 2 ♂, 2 ♀, vii.3.63, R. D. Anderson (RDA). Pinegrass Pk., 1, viii.8.25, Statterthwait (USNM). *Park County.* Kenosha Pass, 10,000 feet, 3, vii.16.38, J. W. Green (CAS). **MICHIGAN.** *Cheyboygan County.* Smith's Bog, 1 ♂, vii.5.52, P. J. Spangler (USNM). *Livingston County.* E. S. George Reserve, 7, vi.10.50, F. N. Young (CAS). *Marquette County.* Marquette, 7, vii.1-2.16 (USNM); 1 ♀, vii.2.16, J. D. Sherman, Jr., (AMNH). **MONTANA.** *Carbon County.* E. Rosebud L., 1 ♀, vi.19.61 (DAV). **NEW YORK.** *Essex County.* Mt. Marcy, L. Tear, 1 (USNM). *Tompkins County.* Ithaca, 4, vi.9.17; 2, vi.17.17; 2, v.21.26, H. Dietrich (CNL). **NEW HAMPSHIRE.** *Coos County.* Mt. Washington, 1 (USNM). Peabody Spring, 5000 feet, 1 ♀, ix.—.—, J. Sherman, Jr. (AMNH). Starr L., 4800 feet, 1 (USNM). Storm L., 4930 feet, 1 (USNM). *Crafton County.* Rumney, 1 ♂, 2 ♀, iv.21.16; 1 ♂, 1 ♀, iv.22.16; 1 ♂, iv.17.27, Darlington (MCZ). **NEW MEXICO.** *San Juan County.* Chuska Mtns., Washington Pass, 9000 feet, 50+, x.5.68, JRZ (NMSU). **NORTH DAKOTA.** *Benson County.* Ft. Totten Lake, 8, vi.21.21, C. K. Sibley; 14, viii.22.20 (CNL). *Bottineau County.* Turtle Mtns., Fish Lake, 8, vii.13.21; L. Metigishe, 1, vii.22.21; Dion Lake, vii.15.21, C. K. Sibley (CNL). *Ramsey County.* Devil's Lake, S. Odessa Pond, 1, vii.5.21; N. Odessa Pond, 1, viii.5.21, C. K. Sibley (CNL). **VERMONT.** *Chittenden County.* Mt. Mansfield, Lake Cloud,

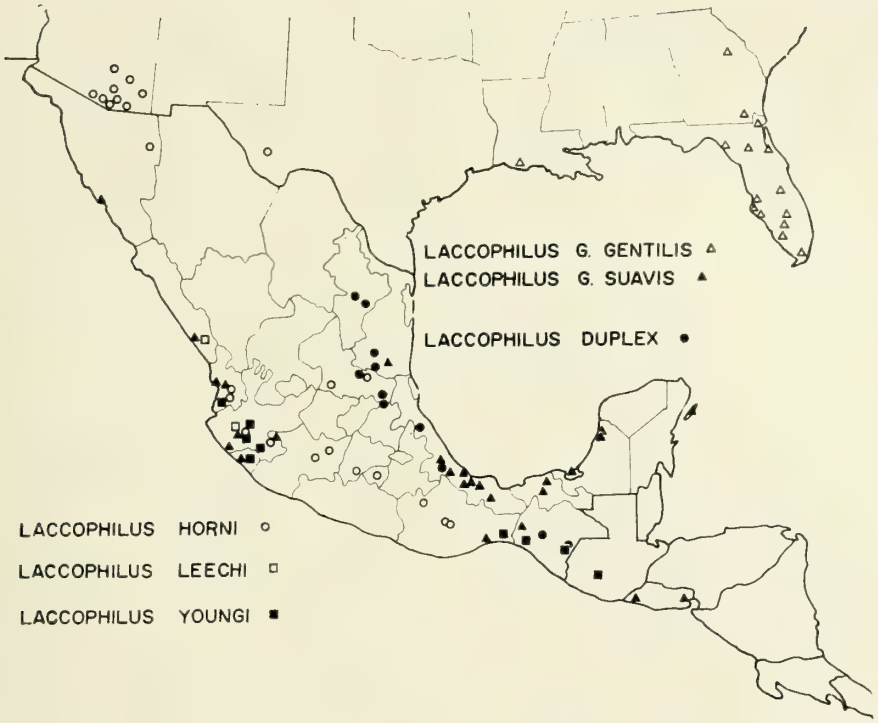

Figure. 23. Distribution of *Laccophilus gentilis, L. duplex, L. horni, L. leechi,* and *L. youngi.*

1, iv.19.13 (USNM). **WISCONSIN.** *Oneida County.* Three Lakes, 11, 1, ix.—.04 (USNM); 3 ♂, 1 ♀, W. S. Marshall (AMNH). **WYOMING.** Yellowstone Natl. Park, 8000 feet, 1 ♀, viii.17.33, E. B. Andrews (CAS).

Laccophilus horni Van den Branden (Figs. 209-216, 324)

Laccophilus lateralis Horn, 1883, p. 282. *Lectotype,* male, Academy of Natural Sciences, Philadelphia, No. 2961, Arizona.

Laccophilus horni Van den Branden, 1885, p. 21; Leng, 1920, p. 76; Zimmermann, 1920, p. 19.

DIAGNOSIS. — Elytral pattern, pronotal markings, and absence of metacoxal file separate this species from all other ones in North America. Only *pictus* and *leechi* have an elytral pattern with yellow spots on a black or nearly black background. *L. pictus* has a file and darkened epipleura. The epipleura are pale in *horni,* and the arrangement of the spots is different (figs. 300-304, 324). *L. horni* and *L. leechi* have very similar elytral patterns and lack files, but the pronotal markings of *leechi* are more extensive. Also, *horni* has a mean length of about 4.5 mm; and *leechi* is only about 3.5 mm long.

DESCRIPTION. — Medium (length, 4.10 to 4.95 mm; width, 2.45 to 3.10 mm), dark brown or black species with yellow spots; metacoxal file absent, prosternal process short; sawlike ovipositor. COLOR. *Head*: pale brownish-yellow faintly tinged with red except for dark reddish-brown occiput between the eyes; appendages pale. *Pronotum*: pale brownish-yellow tinged with red in center and laterally, but with dark reddish-brown bilobed spots on front between the eyes and at the apex; entire posterior margin translucent brownish-red. *Elytra*: strongly marked spotted pattern of yellow and very dark reddish-brown or black; epipleura pale anteriorly, posterior half may darken to reddish-brown. *Tergite VIII*: pale yellow-brown. *Venter*: medium yellowish-brown; pro- and mesolegs generally paler, darker at the bases of mesocoxae and on the metacoxal plates around the base of the hind legs; lateral margins of plates also dark reddish-brown. *Genitalia*: variably pale reddish yellow-brown to reddish-brown. ANATOMY. *Microreticulation*: double on head, pronotum, and elytra; surface shining. *Head*: supraclypeal seam arching slightly above the clypeal margin. *Pronotum*: relatively short since angle between it and the elytra approaches 180 degrees; WH/PW, 0.69; LP/PW, 0.38; surface roughened, but shiny. *Elytra*: apical truncation barely perceptible; females without epipleural flange. *Venter*: prosternal process short, slender, with well-defined crest; postcoxal processes not laterally projecting past the midline, but instead forming a nearly straight line or bending slightly more anteriorly than the midline; last abdominal segments of both sexes not truncated, but perhaps somewhat elongated to subtriangular; deep, marginal groove extending almost the entire lateral posterior margin to the crest in females and about half the length of the margin on either side of the apex in males; median crest nearly symmetrical in both sexes; numerous setigerous punctures scattered over the surface, thickest on crest. *Legs*: male pro- and mesotarsi enlarged slightly in a dorsoventral plane; fifth tarsal segments on both pair of front legs one and three-quarters to twice as long as corresponding fourth; mesofemoral setae (8 to 9) much larger than profemoral ones (7); metatibial spur nearly as long as two tarsal segments. *Genitalia*: oval plate with produced acuminate point; its median crest only distinctly raised near apex, but apparent anteriorly with a bend to the right; a few weak raised lines on either side; aedeagus simple and tapering gradually along entire length; right paramere with blunt apex; ovipositor with about 14 sawlike teeth.

NOMENCLATURAL NOTES. — Horn (1883) used a preoccupied name in describing this species, and this was corrected by Van den Branden (1884).

VARIATION. — Although the yellow elytral spots vary in size, there is no particular geographic trend. The subbasal spots may be completely joined or separated into two or three discreet ones.

Females tend to be slightly larger than males. The peak frequency for females lies at about 4.6 mm and that for males at about 4.5 mm (fig. 25). In a total of 254 specimens measured, however,

Table 19. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus horni*.

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Santa Cruz Co.,	♂	56	4.52	0.138	3.61	0.095	(44)	2.68	0.075	2.17	0.054	0.601	0.0037
Arizona	♀	60	4.59	0.135	3.67	0.102	(49)	2.71	0.081	2.19	0.075	0.596	0.0043
Huachinera,	♂	11	4.57	0.158	3.65	0.137	....	2.76	0.131	2.17	0.094	0.593	0.0047
Sonora	♀	7	4.66	0.085	3.73	0.098	....	2.77	0.073	2.21	0.047	0.594	0.0089
Autlan, Jalisco	♂	3	4.45	.....	3.56	.....	....	2.62	.....	2.04	.....	0.573	.....
	♀	6	4.42	0.164	3.55	0.125	....	2.60	0.134	2.04	0.088	0.573	0.0060
Tzitzio,	♂	14	4.46	0.212	3.59	0.097	(13)	2.65	0.065	2.08	0.060	0.580	0.0038
Michoacan	♀	15	4.46	0.159	3.61	0.143	(12)	2.69	0.100	2.10	0.077	0.582	0.0057
Huajuapan,	♂	5	4.53	0.129	3.66	0.177	(3)	2.66	.....	2.11	0.084	0.577	0.0084
Oaxaca	♀	6	4.47	0.125	3.62	0.102	(4)	2.73	0.081	2.08	0.096	0.574	0.0143

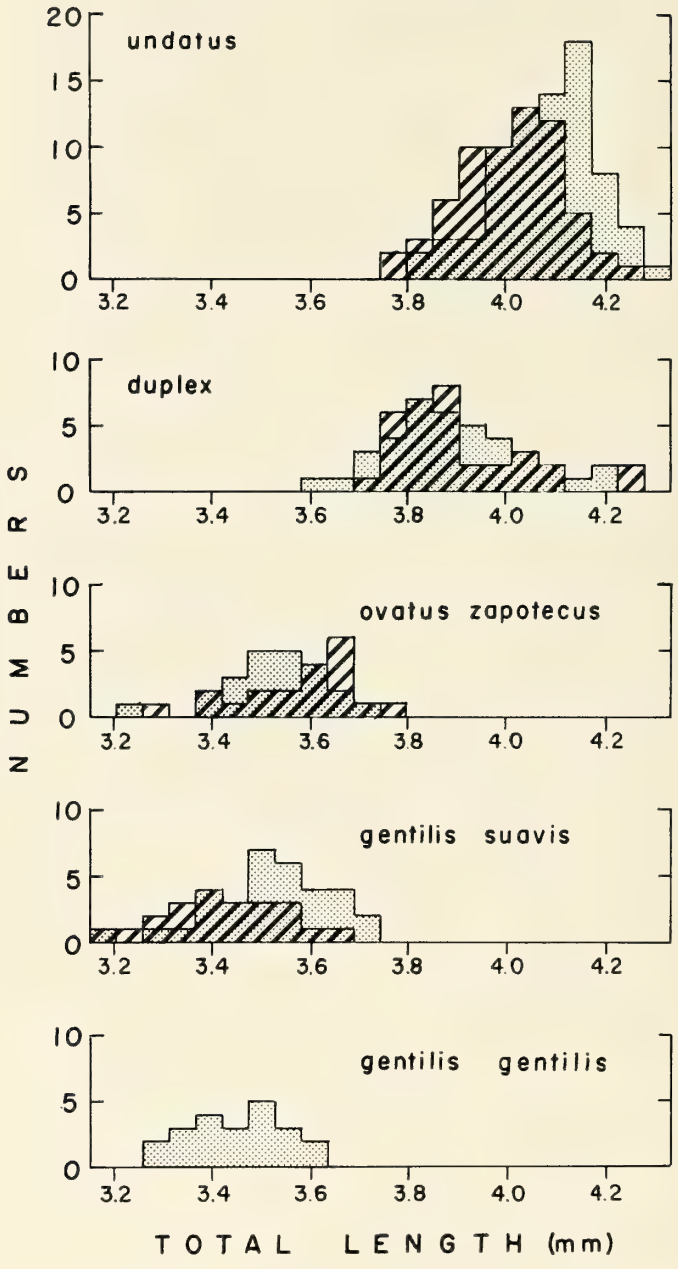

Figure 24. Histograms of length in *Laccophilus gentilis, L. ovatus, L. duplex,* and *L. undatus.* Males shown in crosshatch; females, stippled.

the largest individual was a male that was about 5.0 mm long. There may be some geographical variation in the size of females compared to males. In two samples (Table 19) from Arizona and Sonora, there is a fairly good separation of the means of females and males. The mean length of females over males in the Arizona sample is highly significant, but from Jalisco south, there is no difference. Sonoran region populations are longer, but with the large gap in samples, it cannot be determined if the difference is racial, clinal, or local.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — The distribution as now known of *Laccophilus horni* is separated into four areas (fig. 23). One is in southeastern Arizona and northeastern Sonora, another in the Davis Mountains in Texas, the third in San Luis Potosi, and the last in a fairly continuous chain from Nayarit to Oaxaca. Some of the separation appears to be due to a lack of collecting. It seems likely that there should be populations almost continuously from the one in northeastern Sonora to Nayarit. On the other hand, the Davis Mountain population may be truly allopatric to any other populations. There is a little suitable habitat between it and populations to the west or south. The San Luis Potosi localities are close enough to those in Michoacan to suspect that they are not truly allopatric populations.

L. horni has a high fidelity for stream pools occurring in oak woodland. In all parts of its range it is found near oak in hilly terrain. It can be collected anywhere between 1000 and 5000 feet in streams or pools that have granitic gravelly bottom. It prefers to stay in extremely shallow water (3 inches or less), darting from one pebble to the next. The easiest way to collect this species is to strain some gravel with the rim of a metal sieve just above the water surface and allow the specimens to swim upward where they can be picked up with a forceps. They are probably one of the more difficult species to collect in large numbers, which probably explains why they are seldom abundant in collections.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ARIZONA.** *Cochise County.* Chiracahua Mtns., 1, v.9.—, Hubbard & Schwarz (USNM); H. Martyr L., 2 ♂, 2 ♀, ix.5.61, JRZ (NMSU); Portal, 1 ♂, viii.—.58, P. Opler (BERK); SWRS, 1, vii.4.56, O. L. Cartwright (USNM); 1 ♂, 1 ♀, vii.22.56, E. Ordway; 1 ♀, vii.19.57, M. Stathen (AMNH); Cave Ck. Cn., 1 ♀, ix.13-14.—, B. Malkin

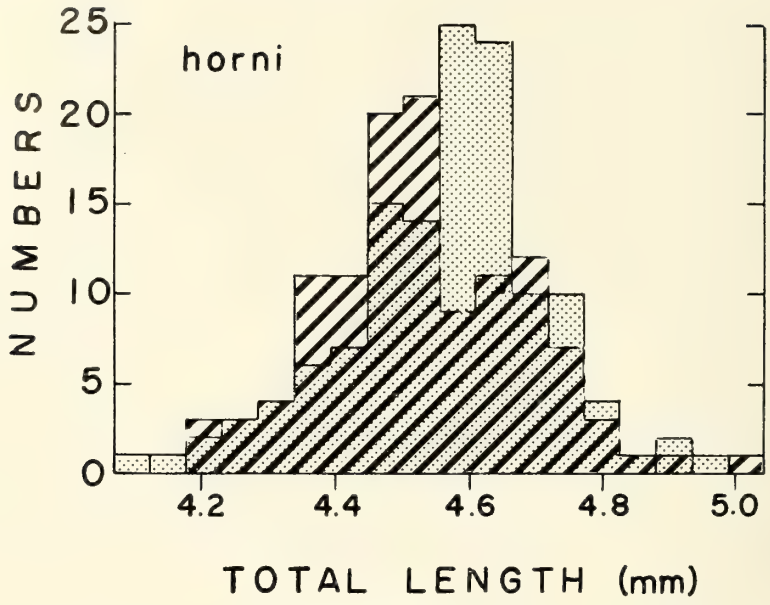

Figure 25. Histograms of length in *Laccophilus horni*. Males shown in crosshatch; females, stippled.

(FM). Huachuca Mtns., Bear Canyon, 1, v.8.53, A. & H. Dietrich (CNL). *Gila County*. Pinal Mtns., 1, iv.—.—, D. K. Duncan (CNL); 1, vi.15.47, F. H. Parker (CAS). *Graham County*. Graham Mtn., Marijilda Canyon, 11 ♂, 16 ♀, ix.12.52, B. Malkin & V. E. Thatcher (FM). *Pima County*. Baboquivari, 2, —.—.24, C. C. Poling (CNL); 7, ix.24.33, Bryant (CAS). Catalina Mtns., 2, iv.18-v.16.—, Hubbard & Schwarz (USNM); Sabino Canyon, 2, vii.11.49, D. J. & J. N. Knull (USNM); 1 ♀, ix.6.63, V. L. Vesterby (DAV); 25, xii.28.50, R. S. Beal (BERK); Molino Basin, 3, vi.11.58 (CAS); 1 ♂, vi.9.54, R. S. Beal (NMSU); 3 ♂, 2 ♀, vi.9.54, R. S. Beal (BERK); 1 ♀, xi.27.27, F. H. Parker; 1 ♀, x.16.43, J. Hendrickson (ARI). *Santa Cruz County*. Nogales, 2, iv.—.97, Koebele (CAS). Pena Blanca, Pajarito Mtns., 4 ♂, 3 ♀, vii.26.64, R. H. Arnett & E. Van Tassel (CUA). Santa Rita Mountains, 1 ♀, xi.6.24, A. A. Nichol (MCHS); Madera Canyon, 1 ♀, x.2.63, V. L. Vesterby (DAV); 4, vii.26.55, F. X. Williams (CAS); 1 ♀, vi.6.56, A. Menke (LACM); Florida Canyon, 3 ♀, viii.6.62; 1 ♀, ix.7.61; 2 ♂, 1 ♀, xii.2.61, JRZ (NMSU). Tumacacori Mtns., 12 ♂, 6 ♀, vii.27.65, H. B. Leech (CAS). **TEXAS.** *Davis County*. Davis Mtns., Madero Canyon, 1, vi.14.16, F. M. Gaige (USNM); Phantom L., 2, viii.20.16, F. M. Gaige (CAS). County, 4 ♂, 4 ♀, viii.10.16 (MCHS).

MEXICO. — **JALISCO.** Mazamitla, 17 m. S., 1 ♀, xii.5.48, H. B. Leech (CAS). Between Autlan and Union de Tula, R. San Pedro, 3 ♂, 7 ♀, iii.28.64,

JRZ (NMSU). **MEXICO.** Tonatico, 5 ♂, 2 ♀, viii.29.62, JRZ (NMSU). **MICHOACAN.** Tzitzio, 3 ♀, vii.27.62; 3 m. S., 17 ♂, 15 ♀, viii.22.63, JRZ (NMSU). Uruapan, 10 m. S., 1 ♂, 1 ♀, iii.26.64, JRZ (NMSU). **MORELOS.** Cuerna (vaca?), 1 ♀, v.—.—, Barrett (CAS). **NAYARIT.** Sierra de Zapotan, 2 ♀, xi.—.42, Eugenio Paredes (CAS). Tepec, 25 m. SE., 4 ♂, 2 ♀, xi.23.48, H. B. Leech; 25 km. S., 1 ♂, 1 ♀, ix.24.53, B. Malkin (CAS). **OAXACA.** El Tule, 1 ♂, ix.6.64; Huajuapan, 2 km. S., 4 ♂, 4 ♀, ix.4.64; 17 km. NE., 1 ♀, ix.3.64; Oaxaca, 3 m. S., 1 ♀, viii.26.63, JRZ (NMSU). **SAN LUIS POTOSI.** Cuidad del Maiz, 14-15 m. E., 1 ♂, 2 ♀, ix.19.48; San Luis Potosi, 2 m. S., 2 ♂, xi.21.48, H. B. Leech (CAS). **SONORA.** Huachineura, 11 ♂, 7 ♀, vii.25.63, JRZ (NMSU).

Laccophilus leechi, new species (Figs. 217-224, 325)

DIAGNOSIS. — Small size, yellow spotted elytral pattern, darkened pronotal disc, and no metacoxal file separates *leechi* from all other North American *Laccophilus. L. leechi* most resembles *horni;* and if it were not for their apparent sympatry, it would be described as a race of the latter. It differs from *horni* only in its much smaller size, in the slightly different conformation of the aedeagus, and in the more broadly pigmented pronotum. *L. leechi, L. gentilis suavis* and *L. oscillator laevipennis* are about the same size and sympatric, but *suavis* and *laevipennis* have nearly complete subbasal elytral bands and much lighter pronota. *L. g. suavis* also has a file. The aedeagi of it and *leechi* are quite different, but *L. oscillator laevipennis* has a similar aedeagus. All other species in western Mexico are either much larger or have irrorated patterns.

DESCRIPTION. — Small (length, 3.5 to 3.8 mm; width, 2.1 to 2.2 mm), dark reddish-brown to black species with yellow spots; metacoxal file absent; prosternal process intermediate; ovipositor sawlike. COLOR. *Head*: pale yellow above and beneath except dark reddish-brown on occiput between the eyes; appendages except mandibles, pale yellow. *Pronotum*: large reddish-brown blotch extending from between the eyes to the apex; remainder pale yellowish-brown. *Elytra*: strongly contrasting, spotted pattern of yellow and dark reddish-brown or black; epipleura entirely pale or with posterior portion of translucent reddish-brown. *Tergite VIII*: distal half pale yellowish-brown, basal half dark brown. *Venter*: generally pale yellowish-brown tinged with red except for around mesocoxal bases and lateral margin of the metacoxal plates, or entire metasternum and venter strongly suffused with black or dark reddish-brown; pro- and mesolegs generally pale brownish-yellow; hind legs darker and tinged with red. *Genitalia*: variable from pale brownish-yellow to reddish-brown. ANATOMY. *Microreticulation*: secondary reticulation strongly developed and individual cellules only weakly visible on head; pronotum and elytra double and with inner cellules showing distinctly only on the elytra; surface shining. *Head*: supraclypeal seam closely parallel to margin. *Pronotum*: relatively short; WH/PW, 0.69; LP/PW, 0.38. *Elytra*: apical truncation barely perceptible; female epipleura without flange (only six females examined). *Venter*: prosternal process intermediate, extending nearly as far posteriorly as an imaginary

line drawn across the rear of the mesocoxal cavities and the groove which receives it extending beyond that line; postcoxal processes not laterally extending beyond the midline, but with hind margins extending straight across or curving slightly anteriorly; last segment of male and female similar, not truncated, but rounded or subtriangular with nearly symmetrical median crests; scattered setigerous punctures and a marginate groove on female segment. *Legs*: mesotarsi of males enlarged slightly at most; fifth tarsal segment of both pair of front legs about twice as long as corresponding fourth; palettes barely visible at 20 power magnification; profemoral setae (5 or 6) occurring in two distinct clumps and as long as but finer than those on mesofemur (7 to 8). *Genitalia*: oval plate with produced, acuminate tip and median crest; aedeagus curving only slightly over posterior three-quarters of length, abruptly narrowed near tip; ovipositor with about 18 pair of sawlike teeth.

VARIATION. — The most obvious color variation is a dark venter on the single specimen taken in Jalisco. Dark pigment suffuses most of the metacoxal plates and abdomen. Those from Sinaloa had dark pigment confined to leg bases and along the metacoxal margin. The effect is striking enough to suggest that perhaps two different races may exist, but not enough is known yet to determine this.

Males and females appear to be about the same size; but with only nine specimens, little can be said about any difference (Table 19).

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This species has been collected at only two localities and on but three occasions (fig. 23). One locality is at the base of the Sierra Madre Occidental eight miles east of Concordia on the highway between Mazatlan, Sinaloa, and Durango. *L. leechi* was taken there on two different occasions. The stream bed has many quiet pools and large boulders along its course. The insects seem to be both among the rocks and pebbles and in places where there is some mud on the bottom. The only other place it has been collected is in the valley in Jalisco in which the village, La Huerta, is located. In this instance a single specimen was taken along the margin of a small stream (three to four feet wide), which had a bottom of mud and volcanic pebbles, grass along the margins, and no large boulders.

MATERIAL EXAMINED

Holotype male, 8 miles E. of Concordia, iv.13.68, B. Reilly and J. R. Zimmerman; *allotype* female, from same locality, but taken by J. R. Zimmerman, on xii.12.62, are both in the United States National Museum. Also one male and one female paratype with the same data as the allotype are in the California

Table 20. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus leechi*.

Locality	N	length		elytral length		width		pronotal width		PW/EL	t_{95}
Concordia, Sinaloa	7	3.60	0.077	2.86	0.088	2.13	0.041	1.71	0.044	0.598	0.0110

Academy of Sciences, San Francisco; one female paratype, same data is in the Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico, and the University of Michigan Museum of Zoology, Ann Arbor.

MEXICO. — **JALISCO.** La Huerta, 5 m. N., 1 ♀, x.25.66, A. H. Smith & JRZ (NMSU). **SINALOA.** Concordia, 8 m. E., Rd. 15, 1 ♂, 1 ♀, xii.12.68, JRZ (NMSU).

Laccophilus undatus Aubé (Figs. 225-233, 322)

Laccophilus undatus Aubé, 1838, p. 435. *Neotype*: male, United States National Museum, Bloomington, Monroe Co., Indiana, iv.20.56, J. R. Zimmerman; Crotch, 1873, p. 400; Blatchley, 1910, p. 210; Leng, 1920, p. 77; Zimmermann, 1920, p. 27; Zimmerman, 1960, p. 144.

DIAGNOSIS. — The variegated elytral pattern and darkened palpi and antennae separate *undatus* from all other North American *Laccophilus.* The only other species with darkened antennae and palpi is *biguttatus,* but it has nearly unicolorous elytra of brownish-yellow color.

DESCRIPTION. — Small to medium (length, 3.2 to 4.3 mm; width, 2.0 to 2.3 mm), brown and yellow, variegated species; metacoxal file absent; prosternal process short; ovipositor sawlike. COLOR. *Head*: yellowish-brown with a tinge of red; slightly darker at occiput; appendages with darkened tips on the last two or three segments of the maxillary palpi; sometimes the labial palpi, and the last six or seven segments of the antennae. *Pronotum*: variable reddish-yellow brown or their combinations; usually darker on the disc and paler on lateral margins; a darkened area on the anterior margin between the eyes. *Elytra*: complex variegated pattern superimposed on a pale brownish-yellow background tending to form two incomplete irregular transverse yellow fasciae; one subbasally and the other just behind the middle; epipleura pale brownish-yellow anteriorly, but darkening to reddish-brown posteriorly. *Tergite VIII*: light yellowish-brown. *Venter*: varying combinations of light red, yellow, and brown; prosternum, mesosternum, pro- and mesolegs usually lighter; metacoxal plates, abdomen, and hind legs usually darker, tending more toward reddish-brown. *Genitalia*: about the same as the abdomen, but usually tending more strongly to reddish-brown. ANATOMY. *Microreticulation*: strongly impressed and clearly double on head, pronotum, and elytra; surface shining, especially in males. *Head*: supraclypeal seam diverging slightly upward at midline. *Pronotum*: WH/PW, 0.72; LP/PW, 0.39. *Elytra*: female without epipleural flanges; apices without truncation. *Venter*: metacoxal file absent; postcoxal processes rounded and laterally projecting well past the midline; last ventral segment of both sexes not truncated, but evenly rounded; median crest weak and nearly symmetrical in males; setigerous punctures sparsely distributed; outline of female segment subtriangular with well-defined median ridge; setigerous punctures thicker near apex. *Legs*: pro- and mesotarsi enlarged in a dorsoventral plane; palettes easily visible at 20 power magnification; fifth tarsal segment on both pair of front legs about one and one-half times as long as corresponding fourth;

setae on profemoral margin (6) similar in length and diameter to those on mesofemur (6 to 7). *Genitalia*: oval plate with strongly produced asymmetrical acuminate tip; crest extending anteriorly with slight curvature to the right; more fine lines on right than on left side of the crest; aedeagus curved sharply at about two-thirds its length and twisted with conformation suggestive of a raised cobra; right paramere less broadly triangular than in *maculosus*; left paramere with less rounded apex than in *maculosus* tending to form an angle; ovipositor with about 16 sawlike teeth.

NOMENCLATURAL NOTES. — Aubé's type of *undatus* is apparently lost. There seems to be no confusion in the identity of this species, however.

VARIATION. — Females are slightly larger than males (Table 21, fig. 24). The individuals from Indiana may be larger than those from New York; but the western sample may be biased, since I had more material and probably selected specimens that were in better condition.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. undatus* occurs from Massachusetts to the vicinity around the southern margin of Lake Michigan and from northern New York and southern Vermont to near Washington, D. C. It ranges west as far as Bloomington, Indiana, and the southern edge of Michigan (fig. 21). It seems to be restricted to the shaded pools of the northeastern deciduous woodlands. In southern Indiana *undatus* was consistently found only in slough ponds in the drainage of a former intermittent stream. Those ponds were acidic with a pH of 6.6. Temperatures seldom, if ever, exceeded 30 degrees C. The bulrush *Scirpus* was abundant along the margins and was the principal emergent plant. *Ludwigia* and *Zannichellia,* which are characteristic of temporary aquatic situations, covered the bottom.

L. undatus approaches *L. schwarzi* near Washington, D. C., but so few specimens of either have been taken from there that it is not known whether they intergrade or not. Their anatomical features are sufficiently different to presume they do not. *L. undatus* is also sympatric without intergrading with *L. biguttatus* in upstate New York.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ILLINOIS.** *Lake County.* Lake Forest, 1 ♂, 2 ♀, ix.2.— (FM). **INDIANA.** *Lake County.* Miller, 2; Pine (Gary), 25, ix.23.30 (USNM). *Monroe County.* Bloomington, 4 m. N., 25 ♂, 1 ♀, iii.6.56; 2 ♂, 4 ♀, iii.21.56; 1 ♂, iv.10.56; 1 ♂, iv.20.56; 11 ♂,

Table 21. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus undatus*.

Locality		N	length		elytral length		width		pronotal width		PW/EL	t_{95}
New York,	♂	16	3.97	0.108	3.13	0.082	2.18	0.070	1.77	0.045	0.566	0.0077
New York	♀	19	4.04	0.084	3.21	0.075	2.23	0.065	1.80	0.043	0.560	0.0053
Monroe Co.,	♂	48	4.04	0.099	3.20	0.085	2.18	0.054	1.78	0.041	0.557	0.0025
Indiana	♀	46	4.13	0.102	3.26	0.093	2.23	0.064	1.80	0.050	0.551	0.0026

8 ♀, iv.26.56; 3 ♀, v.11.56; 3 ♀, vi.7.56; 9 ♀, x.31.56; 10 ♀, xi.13.56; 8 ♀, xi.28.56; 2 ♀, vi.18.57, JRZ (NMSU). **MARYLAND.** *Montgomery County.* Near Plummers Island, 1, ix.12.19, J. L. Wren (USNM). **MASSACHUSETTS.** *Berkshire County.* Egremont, 1 ♀, C. H. Roberts (AMNH). *Essex County.* North Saugus, Howlett's Pond, 1, viii.25.07, D. H. Clemons (USNM). *Middlesex County.* Framingham, 1, iv.10.19, C. A. Frost (CNL). *Norfolk County.* Brookline, 20 (USNM); 1 (CNL). *Suffolk County.* Boston, 1 ♀ (ANSP). Cambridge, 1 (USNM). *Worcester County.* Brookfield, 2, x.24.24, Chamberlain (CNL). Northboro, 1, i.—.37, C. A. Frost (BERK). **MICHIGAN.** *Berrien County.* Stevensville, 2 ♂, 1 ♀, vi.9.63, vii.10.63, R. B. Willson (MCHS). **NEW JERSEY.** *Bergen County.* Fort Lee, 48, ix.22.00, J. D. Sherman, Jr. (USNM). Ramsey, 1 ♀, v.17.—, C. H. Roberts (AMNH). *Camden County.* County, 1 ♂, vi.11.— (AMNH). *Mercer County.* Trenton, 1 ♀, iv.23.—, E. L. Dickerson (AMNH). *Middlesex County.* Spotwood, 1 ♀, C. H. Roberts (AMNH). *Ocean County.* Lakehurst, 6 ♂, 2 ♀, v.29.—, C. H. Roberts (AMNH). *Sussex County.* Stanhope, L. Lackawanna, 1 ♀, viii.14.32 (CNL). **NEW YORK.** *Brooklyn County.* Brooklyn, Cyp. Hills, 2, v.16.10, Shoemaker (USNM). *Cattaraugus County.* Alleghany, 2 ♀ (FM). *Richmond County.* Staten Island, Clove Valley, 1 ♂, vi.3.—, W. T. Davis (MCHS); 24 (USNM); 6, iv.16.05 (USNM); 2 ♂, 1 ♀, x.11.24, L. B. Woodruff (AMNH); 1 ♂, 11 ♂, 10 ♀, iv.19.—; 2 ♀, v.20.—, C. H. Roberts (AMNH). *Erie County.* Buffalo, 1 ♂, 2 ♀ (AMNH). *Long Island, New York City,* and *Vic.* Cold Spring Harbor, 1 ♂, viii.10.00 (AMNH). Long Island, Forest Pk., 4, v.—.— (USNM); 12, v.7.10 (USNM). New York City, 2 ♀, C. H. Roberts (AMNH). *Suffolk County.* Orient, 25, vi.30.43, R. Latham (CNL). Riverhead, 11, iv.30.40, R. Latham (CNL). *Ulster County.* Esopus, 6, J. D. Sherman, Jr. (USNM); 2 ♂, 2 ♀, ix.1.—, C. H. Roberts (AMNH). *Washington County.* Washington County, 1, J. D. Sherman, Jr. (USNM). *Westchester County.* Peekskill, 3 (USNM). **OHIO.** *Jackson County.* Jackson, 1, x.20.50, P. J. Spangler (CAS). **PENNSYLVANIA.** *Delaware County.* 3 ♂, 2 ♀, v.18.— (ANSP). *Philadelphia County.* Phila-Neck, 2 (USNM). Philadelphia, Wyoming, 1, iv.29.04, G. M. Greene (USNM). **RHODE ISLAND.** 1 ♂, 1 ♀, Kemp Coll. (ANSP). **VERMONT.** *Bennington County.* Bennington County, 1 (USNM); 1 ♀ (CNG); 3 ♂, 2 ♀, ix.16.—, 2 ♂, vii.—.94; 1 ♀, vii.14.—, C. H. Roberts (AMNH); 1 ♀ (ANSP). **VIRGINIA.** *Fairfax County.* Black Pond, 1, ix.21.—, Shoemaker (USNM).

Laccophilus schwarzi Fall (Figs. 234-241, 323)

Laccophilus schwarzi Fall, 1917, p. 165. *Holotype*: male, location unknown, Ash Grove, Virginia, Leng, 1920, p. 77.

DIAGNOSIS.— The shining surface, elytral pattern, and entirely pale antennae and palpi separate this species from the similar *undatus.* Larger size and pale elytral markings separate it from *g. gentilis.* All other species in the eastern United States are irrorated with files.

DESCRIPTION. — Small (length, 3.9 to 4.2 mm; width, 2.1 to 2.3 mm), brownish-red and yellow variegated species; metacoxal file absent; prosternal process intermediate; ovipositor sawlike. COLOR. *Head*: pale brownish-yellow, labrum and clypeal region immediately above sometimes slightly darker; appendages pale; little or no darkening at the base of the pronotum. *Pronotum*: generally pale brownish-yellow, but with dark reddish-brown marking on the anterior margin between the eyes and a weaker one that extends along the posterior margin which tends to join the anterior one across the disc. *Elytra*: reddish-brown markings on a yellow background; two nearly complete transverse irregular fasciae; one subbasally and the other behind the middle; epipleura pale anteriorly but with dark ventral-medial edge; posterior half dark. *Tergite VIII*: pale brownish-yellow. *Venter* and *legs*: generally variable from pale reddish-yellow-brown to light reddish-brown, but noticeably darkened on the lateral and posterior margins of the metacoxal plates and to a lesser extent around the postcoxal cavities. *Genitalia*: variably reddish-yellow-brown. ANATOMY. *Microreticulation*: strongly double on head, pronotum, and elytra with individual cellule outlines weak; surface shining. *Head*: supraclypeal seam continuing parallel to margin well beyond the most ventral part of the margin. *Pronotum*: relatively short; WH/PW, 0.71; LP/PW, 0.41. *Elytra*: truncation not apparent and hence producing a more attenuated appearance than in *maculosus*; epipleural flange absent. *Venter*: prosternal process of intermediate length with apex reaching nearly to the posterior line of mesocoxal cavities and the groove which receives it well posterior to cavities; postcoxal processes rounded and laterally projecting posterior to midline; outlines of last visible abdominal sternites of males and females similar with weak nearly symmetrical crests; not truncated, not produced; sparsely covered with numerous setigerous punctures. *Legs*: male pro- and mesolegs scarcely if at all enlarged, and palettes difficult to distinguish at 20 power magnification; fifth tarsal segment on both pair of front legs about one and one-half to one and three-fifths as long as corresponding fourth; profemoral setae (7 to 8) about equal in size and length to mesofemoral ones (10 to 12). *Genitalia*: oval plate asymmetrical with long produced acuminate tip; its median crest extends anteriorly with little lateral curvature; raised lateral lines few and weak; aedeagus thin with no distinctive projections; right paramere elongated and nearly as long as left; each blade or ovipositor with about 12 rather broadly gapped sawlike teeth.

NOMENCLATURAL NOTES. — I have examined several paratypes of *schwarzi,* but have not seen the type. No confusion exists about its identity. The only problem that might be posed is whether it is a race of *undatus* or *gentilis.* Those possibilities seem unlikely; and in fact, *schwarzi* seems to share more characteristics with *duplex* than any other species. The nearest record of *duplex* is in Nuevo Leon, Mexico, which makes it doubtful that the two forms are subspecifically related.

Table 22. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus schwarzi*.

Locality		N	length		elytral length		width		pronotal width		PW/EL	t_{95}
District of	♂	13	4.04	0.096	3.16	0.087	2.18	0.060	1.84	0.050	0.582	0.0046
Columbia	♀	14	4.06	0.072	3.16	0.066	2.19	0.050	1.85	0.033	0.586	0.0071

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This is the rarest species of *Laccophilus* in the United States and, perhaps, in North America. It has been collected only in the vicinity of Washington, D. C., and from Amherst County, Virginia. Fall (1917) quotes Mr. Sherman as follows: "Originally found by Mr. Schwarz at Bladensburg, Md., and has been taken so far as I know, only at the two places (mentioned above), both near Washington, and only in September, in the almost dried-up brooks, in eddies where fallen trees or stumps have made dams in which there is an accumulation of dead leaves, etc., and upon the surface of water where there is a considerable collection of scum and rubbish." F. N. Young has also collected them in a stream near Monroe in nearby Amherst County, Virginia, in late August.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **DISTRICT OF COLUMBIA.** *District,* 3 ♀ (CARR). **MARYLAND.** *Prince George County.* Bladensburg, 13, ix.21.10, J. D. Sherman (USNM); 2 ♂, 1 ♀, J. D. Sherman (AMNH). **VIRGINIA.** *Amherst County.* Near Monroe, 2 ♂, 3 ♀, viii.28.59, F. N. Young (NMSU). Not located. Ash Grove (near Washington), 15, ix.22.10 (USNM); 9 ♂, 8 ♀, ix.22.10; 6 ♂, 7 ♀, ix.—.—, J. D. Sherman (AMNH).

Laccophilus duplex Sharp (Figs. 242-249, 328)

Laccophilus duplex Sharp, 1882b, p. 12. *Type*: male, British Museum (Natural History), Oaxaca. Zimmermann, 1920, p. 18; Blackwelder, 1944, p. 74.

Laccophilus optatus Sharp, 1882b, p. 13. *Type*: male, British Museum (Natural History), Chontales, Nicaragua. Zimmermann, 1920, p. 23; Blackwelder, 1944, p. 74. **(New synonym.)**

DIAGNOSIS. — This species is very similar to *oscillator* in general appearance and anatomy. They both have the same general elytral pattern with pale markings at approximately the same position. The subbasal band appears to be more restricted in *duplex,* however, and is more strongly margined by darker pigment. There is no posterior finger of lighter color from the band in *duplex,* as there is in *oscillator,* nor eroding of the anterior margin of the band in *duplex* as in *oscillator. L. o. oscillator* is larger than *duplex,* but *o. laevipennis* is smaller. Perhaps the best external feature to use is the appearance of the metacoxal plates. In *duplex* the plates are nearly yellow except at the lateral margins where they are darkened to dark brown or nearly black. In contrast *oscillator* has dark color suffused throughout the plate, making the venter much darker. Also, the epipleura of *duplex* are pale, while in *oscillator* they are partially darkened. The aedeagus easily separates the two species, however, since the swollen base of that of *duplex* is highly diagnostic.

Table 23. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus duplex*.

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
Tamazunchale,	♂	5	4.15	0.117	3.26	0.089	....	.....	.....	1.83	0.061	0.561	0.0061
San Luis Potosi	♀	14	4.06	0.114	3.17	0.077	(11)	2.24	0.055	1.81	0.043	0.571	0.0053
Cuahtemoc, Chiapas	♂	3	3.93	.....	3.08	.....	....	2.21	.....	1.79	.....	0.581	.....
Liberia,	♂	21	3.87	0.085	3.04	0.074	....	2.18	0.063	1.75	0.045	0.575	0.0040
Costa Rica	♀	27	3.84	0.106	3.03	0.088	....	2.17	0.074	1.76	0.049	0.581	0.0028

L. gentilis suavis and *L. ovatus zapotecus* are other small forms that have yellow subbasal markings on the elytra, but they are both smaller and narrower and have pale metacoxal plates. Both males and females of those two species have strongly modified last ventral abdominal segments. *L. peregrinus* may have yellow longitudinal, instead of horizontal, markings on the elytra, but either the ovipositor or aedeagus will separate it from *duplex*.

DESCRIPTION. — Small (length, 3.8 to 4.3 mm; width, 2.1 to 2.3 mm), brown species with a nearly complete, yellow subbasal elytral band; metacoxal file absent; prosternal process intermediate; ovipositor sawlike. COLOR. *Head*: pale brownish-yellow above and beneath; appendages except mandibles, pale yellow. *Pronotum*: generally pale brownish-yellow, but brown along posterior margin, especially at apex, and some slight darkening near the anterior margin between the eyes. *Elytra*: marmorated brown with yellow markings; epipleura anteriorly translucently pale (may appear to be darker due to darkened margin of underlying metacoxal plate) and posteriorly reddish-brown. *Venter*: generally pale yellowish-brown or brown with a reddish tinge; dark brown or black around base of mesocoxae and on lateral and hind margins of metacoxal plates. *Genitalia*: variable reddish-brown or yellowish-brown. ANATOMY. *Microreticulation*: double on head, pronotum and elytra; individual cellules weakly outlined; surface shining. *Head*: supraclypeal seam forming two nearly convergent straight lines. *Pronotum*: relatively short; WH/PW, 0.72; LP/PW, 0.39. *Elytra*: apices not at all truncated, but tending to be slightly attenuated; female without epipleural flange (only 20 females examined). *Venter*: prosternal process reaching an imaginary line drawn across the hind margins of the mesocoxal cavities and with well-defined ventral crest; postcoxal processes laterally scarcely projecting beyond the midline; last abdominal segments not truncated but subtriangular; margins nearly straight in males and slightly convex in females; median crest asymmetrical in males and slightly convex in females; both sexes with scattered setigerous punctures and numerous longitudinal rugae or grooves covering posterior half of the segment; females with marginate groove extending along margin. *Legs*: male pro- and mesotarsi only slightly enlarged and palettes difficult to distinguish at 20 power magnification; fifth tarsal segment on pro- and mesotarsi only about one and one-half times as long as corresponding fourth; proleg claws as long as fifth tarsal segment; profemoral setae (5 or 6) as long as, but finer than mesofemoral ones (6 or 7). *Genitalia*: oval plate with produced acuminate tip; its median crest extending anteriorly without curvature; numerous raised lines on either side; aedeagus with swollen base and attenuated tip; apex of right paramere short and blunt; ovipositor with sawlike teeth.

NOMENCLATURAL NOTES. — J. Balfour-Browne has synonymized *duplex* in the collection of the British Museum and the specimens (three cotypes) that I have examined support that conclusion. Also, F. N. Young has sent me sketches of the elytral patterns and genitalia of the types of *duplex* and *optatus*, and they appear identical.

Sharp's descriptions differ significantly only in the statement that *duplex* has a prosternal process not elongate and that *optatus* has the prosternal process elongate. *L. duplex* was described from Oaxaca and *optatus* from Nicaragua, and this appears to be the principal basis for separating them. He remarks that *duplex* resembles the Brazilian *L. fumatus* Sharp and *optatus* is closely allied to *L. latifrons* Sharp. I have not seen either of these species.

VARIATION. — The yellow subbasal markings vary from a complete band with little interruption, even at the elytral suture, to three separate discrete marks. The difference is geographical, since the Honduras specimens tend toward discreteness and the Mexican ones toward continuity. There is no obvious difference in size between the sexes (fig. 24).

The individuals from San Luis Potosi are significantly larger than those from Costa Rica (Table 23). The three males from Chiapas are closer to the size of the southern population. There is enough difference in pattern and size between the populations from northeastern Mexico and those from below the Isthmus of Tehuantepec to warrant description of two races, but it will have to wait until more is known about the limits of each.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This species ranges from near Monterrey in Nuevo Leon to Brazil (fig. 23). It occurs at low altitudes, but above the coastal plain. I have collected it in heavily shaded, shallow, clear streams with gravel bottoms and in roadside ditches.

MATERIAL EXAMINED

COSTA RICA. — Esparta, 8 m. NW., 1 ♀, vi.26.67; Puntarena, 1 ♂, 4 ♀, vii.22.65; Liberia, 8 m. SE., 21 ♂, 31 ♀, vii.24.65, P. J. Spangler; San Jose, 1 ♂, 1 ♀, vii.16.57, D. Lauck (USNM).

EL SALVADOR. — Cd. Arce, 7 m. SE., 2 ♀, viii.3.65, P. J. Spangler (USNM).

HONDURAS. — Ruatan I., 1 ♂ (BM). San Marcus Colon, 1 ♂, 4 ♀, vii.28.65; N. Sabina Grande, 4 ♂, 2 ♀, vii.29.65, P. J. Spangler (USNM).

MEXICO. — **CHIAPAS.** Chiapa de Corzo, 1 ♂, ix.1.63; Cuahtemoc, 3 ♂, viii.30.63, JRZ (NMSU). **NUEVO LEON.** Linares, 20 m. W., Linares R., 1 ♂, xi.16.48, H. B. Leech (CAS). Monterrey, 4 m. S., 1 ♂, vii.7.63, Arnett & Van Tassel (CUA). Santiago, 4 m. N., 1 ♂, vii.8.63, JRZ (NMSU). **SAN LUIS POTOSI.** Cuidad del Maiz, 15 m. E., 1 ♂, xi.19.48, H. B. Leech (CAS). El Salto, 1 ♀, iii.25.63, JRZ (NMSU). Palitla (5 m. N. of Tamazunchale),

2 ♂, 5 ♀, xii.22.48, H. B. Leech (CAS). Tamazunchale, 1, vi.30.48, Werner, Nutting (ARI); Quinta Chilla, 3 ♂, 9 ♀, xii.21.48 (CAS). **TAMAULIPAS.** Antiguo Morelos, 3 m. N., 1 ♀, iii.26.63; Ocampo, 2 ♀, iii.24.63, JRZ (NMSU). **VERACRUZ.** Near Tinaja, 1 ♀, viii.25.62; Papantla, 18 km. E., 1 ♀, ix.9.64, JRZ (NMSU).

NICARAGUA. — Chontales, 2 ♂ (BM).

LACCOPHILUS OSCILLATOR

Sharp (1882b) described *oscillator* and *laevipennis* as separate species, recognizing that they were closely related. In fact, he said the markings of the two were identical, but that they differed in size and in microsculpture. I find no difference in the last feature, but they differ in size. One was described from Oaxaca and the other from Guatemala. It is now known that the range of these two extends through Central America and up the Sierra Madre Occidental into Arizona. Intergrades occur in Nayarit, Jalisco, and Michoacan. Oddly enough, the range of the northern race, *oscillator,* extends all the way to Oaxaca, but apparently at higher elevations than does *laevipennis.*

The aedeagi of the two differ only in size, and all other sexual characters that might be diagnostic are similar. In fact, except for the unusual elytral patterns and the darkened venter, it is difficult to point out a useful diagnostic character for the species.

DESCRIPTION. — Small to medium (length, 3.5 to 5.8 mm; width, 2.4 to 3.4 mm), marmorated brown species with a nearly complete subbasal elytral fascia; metacoxal file absent; prosternal process short; ovipositor sawlike. COLOR. *Head*: pale brownish-yellow above and beneath except for a variable amount of reddish-brown on the occiput between the eyes; appendages except mandibles pale. *Pronotum*: generally pale brownish-yellow, but with a variable amount of reddish-brown on the disc, anterior margin, and apex; posterior margin translucently reddish-brown. *Elytra*: marmorated smoky brown with yellow markings, forming a nearly complete subbasal band and a much less complete postmedian one; the latter composed of three or four elongate marks which are generally, but unevenly arranged in an anterior-posterior direction; epipleura partially darkened anteriorly as well as posteriorly. *Tergite VIII*: proximally brown, but distally pale yellowish-brown. *Venter*: prosternum, pro- and mesolegs pale yellowish-brown with reddish tinge; remainder variable from yellowish-brown to sometimes suffused with reddish-brown or black; nearly black around the bases of the mesocoxae, the outer half of the metacoxal plates, and on parts of abdominal segments; first visible abdominal segment usually pale in contrast to those posterior. *Genitalia*: variably pale yellowish-brown to

Figure 26. Distribution of *Laccophilus oscillator*.

dark brown. ANATOMY. *Microreticulation*: double on head, pronotum, and elytra; cellules of inner meshes very weak. *Head*: supraclypeal seam nearly parallel to margin, but may arch slightly upward near midline. *Pronotum*: WH/PW, 0.70; LP/PW, 0.39. *Elytra*: apices not truncated; female epipleura without flange. *Venter*: prosternal process short; postcoxal process neither rounded nor produced laterally, but forming a nearly straight line across the posterior margins; last visible segment not truncated in either sex and similar; male segment slightly produced; its median crest frequently indistinct; posterior marginated grooves in males and females not attaining the apex; numerous rugae and prominent setigerous punctures also present. *Legs*: male pro- and mesotarsi scarcely enlarged; fifth tarsal segment on both pair of front legs about twice as long as corresponding fourth; palettes difficult to distinguish at 20 power magnification; profemoral marginal setae (5 to 7) as long as, but finer than mesofemoral ones (8 to 11). *Genitalia*: oval plate relatively small and notched on either side of the acuminate produced tip; its ventral median crest pronounced and extending anteriorly with little or no lateral curvature; numerous fine raised lines on either side of the crest; aedeagus curving to a small tapered apex; right paramere nearly as long as left; ovipositor with about 10 or 11 sawlike teeth.

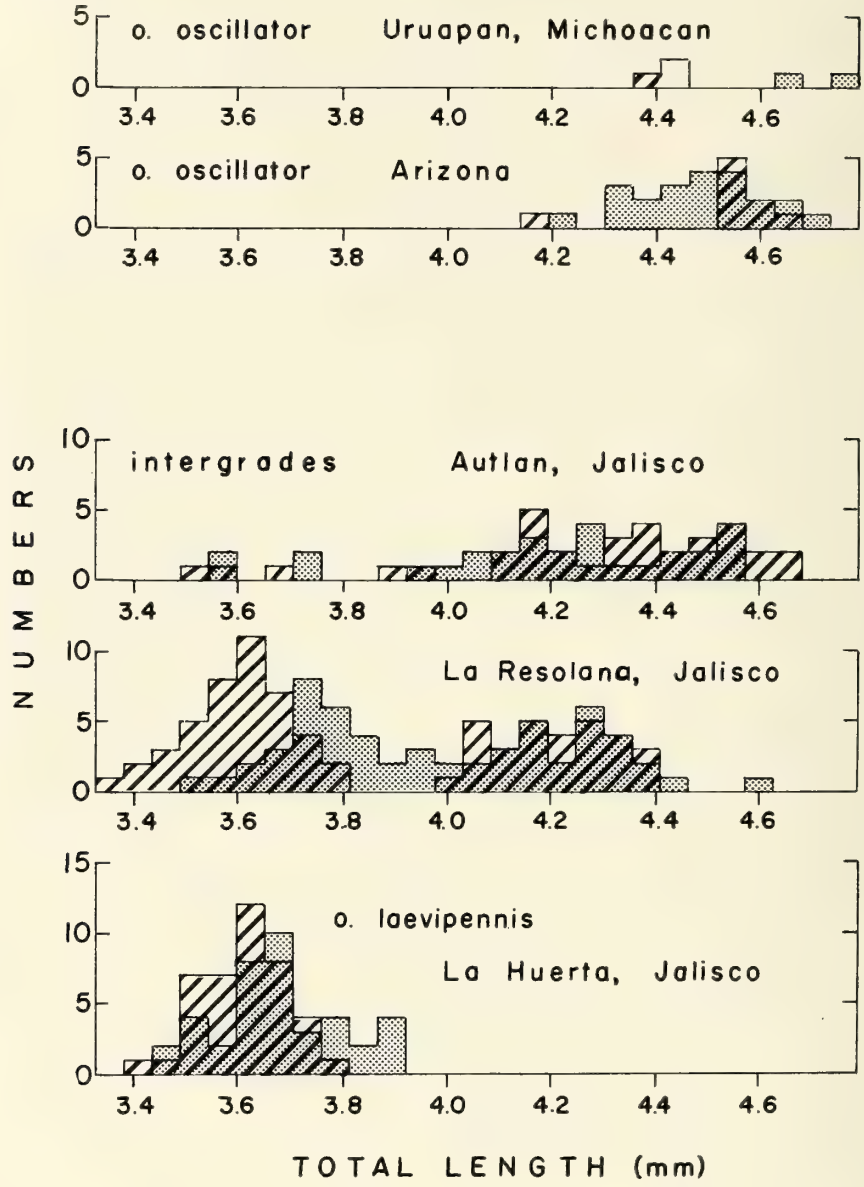

Figure 27. Histograms of length in *Laccophilus oscillator*. Males shown in crosshatch; females, stippled.

Table 24. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus oscillator.*

Locality		N	elytral length				width		pronotal width		PW/EL	t_{95}
			length									
Laccophilus o. oscillator												
Santa Cruz Co.,	♂	9	4.51	0.139	3.53	0.104	2.61	0.111	2.04	0.075	0.578	0.0096
Arizona	♀	23	4.45	0.135	3.56	0.125	2.61	0.082	2.06	0.052	0.581	0.0052
Huachinera, Sonora	♂	4	4.33	0.113	3.48	0.093	2.57	0.112	1.98	0.064	0.570	0.0082
Uruapan,	♂	3	4.40	.....	3.51	.....	2.63	.....	2.08	.....	0.579	.....
Michoacan	♀	2	4.75	.....	3.80	.....	2.82	.....	2.19	.....	0.574	.....
L. o. oscillator × *L. o. laevipennis*												
Sierra de Zapotan, Nayarit	♀	7	4.25	0.218	3.39	0.154	2.56	0.069	1.97	0.082	0.580	0.0083
Autlan, Jalisco	♂	35	4.27	0.286	3.48	0.255	2.51	0.194	1.99	0.127	0.572	0.0039
	♀	36	4.06	0.329	3.27	0.305	2.38	0.203	1.90	0.146	0.583	0.0040
La Resolana,	♂	70	3.83	0.313	3.05	0.290	2.23	0.202	1.77	0.143	0.581	0.0028
Jalisco	♀	48	4.04	0.261	3.22	0.240	2.37	0.050	1.88	0.123	0.583	0.0033
Tzitzio,	♂	7	4.17	0.120	3.35	0.192	2.50	0.089	1.93	0.044	0.576	0.0078
Michoacan	♀	5	4.02	0.121	3.25	0.109	2.41	0.070	1.89	0.066	0.582	0.0173
Laccophilus o. laevipennis												
La Huerta,	♂	41	3.60	0.083	2.85	0.069	2.09	0.057	1.68	0.044	0.590	0.0026
Jalisco	♀	40	3.67	0.115	2.92	0.094	2.12	0.072	1.70	0.048	0.585	0.0027
Chiapas	♂	7	3.68	0.100	2.92	0.058	2.11	0.071	1.70	0.049	0.582	0.0100
	♀	4	3.64	0.115	2.89	0.079	2.06	0.113	1.69	0.078	0.584	0.0209

NOMENCLATURAL NOTES. — The only apparent problem with this race is in its relationship to *laevipennis*. Since intergrades between the two have been found, the problem has resolved itself. Sharp's cotypes of *oscillator* and *laevipennis* may be confused with each other, but the types themselves are easily distinguishable and seem to represent clearly each of the separate races.

Laccophilus oscillator oscillator Sharp, new status (Figs. 250-257, 326)

Laccophilus oscillator Sharp, 1882b, p. 11. *Type*: British Museum (Natural History), male; Oaxaca (Hoege). Zimmermann, 1920, p. 23; Blackwelder, 1944, p. 74.

DIAGNOSIS. — Elytral pattern, dark venter, and lack of a metacoxal file serve to separate this race from all other forms but *laevipennis*, which is smaller. The non-irrorated elytral pattern is quite similar to those found in *duplex* and *subsignatus* Sharp; but both of those have only a suggestion of dark color on the margins of the metacoxal plates, while *o. oscillator* has its plates strongly darkened over most of their surface. The pattern of *duplex* has a more frothy appearance as well. *L. subsignatus* appears to occur only as far north as Panama which is well below the range of *o. oscillator*. The latter form is larger as well (Table 24). *L. horni, L. peregrinus, L. gentilis, L. leechi, L. pictus,* and *L. youngi* are sympatric with *o. oscillator* and have non-irrorated patterns; but each differs considerably in detail and color.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. o. oscillator* has a long, narrow range. It extends from southern Arizona in Pima and Santa Cruz counties to the valley of Oaxaca in the Sierra Madre Occidental, Central Volcanic Highlands, and the Sierra Madre Sur (fig. 26). It appears to be taken most frequently from about 4000 to 6000 feet. From Nayarit south *L. o. oscillator* appears to intergrade with *o. laevipennis* below 4000 feet. It inhabits pools of rocky mountain streams that are frequently subjected to torrential currents. In fact, *L. oscillator* seems to be one of the very few *Laccophilus* that prefers current to pools. I have collected them by sweeping on the under side of large rounded boulders that are subject to heavy current. The race often occurs with *L. horni* and *L. pictus*.

Collections have been spotty, but this is undoubtedly due to the relative inaccessibility of its usual habitat and not due to any real gap in its range.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **ARIZONA.** 4 ♀, 2 ♂ (ANSP). *Pima County*. Sta. Catal. Mtns., Molina Basin, 1 ♀, vi.11.58, C. & G. MacNeill

(CAS); 1, iv.18.53; 1 ♀, A. & H. Dietrich (CNL); Bear Canyon, 1 ♀, vi.18.53, A. & H. Dietrich (CNL). *Santa Cruz County.* Pena Blanca, Pajarito Mtns., 1 ♀, vi.28.62; 1 ♀, vii.20.62, Arnett & Van Tassel (CUA). Santa Rita Mtns., Florida Can., 1 ♀, iv.19.59, F. G. Werner (ARI); 1 ♂, ix.7.61; 4 ♂, 17 ♀, xii.2.61, JRZ (NMSU).

MEXICO. — **JALISCO.** Colima, 29 m. NE., 1 ♂, 3 ♀, xii.3.48; Mazamitla, 1 ♀, xii.1.48; 17 m. S., 2 ♀, xii.5.48, H. B. Leech (CAS). **MICHOACAN.** Tzitzio, 1 ♀, vii.27.62; Uruapan, 10 m. S., 3 ♂, 2 ♀, iii.26.64, JRZ (NMSU). **OAXACA.** Huajuapan, 17 km. NE., 1 ♀, ix.3.64, JRZ (NMSU). Tutla, 1 ♂, 1 ♀, xii.13.48, H. B. Leech (CAS). Oaxaca, 3 m. S., 1 ♂, viii.26.63, JRZ (NMSU). **SONORA.** Huachinera, 3 ♀, vii.25.63, JRZ (NMSU).

Laccophilus oscillator laevipennis Sharp, new status

(Figs. 258, 259, 327)

Laccophilus laevipennis Sharp, 1882b, p. 12. *Type*: British Museum (Natural History), male; San Joaquin, Guatemala City (Champion). Zimmermann, 1920, p. 23; Blackwelder, 1944, p. 74.

DIAGNOSIS. — Except for its smaller size, the same diagnostic characters used for *o. oscillator* apply to *o. laevipennis.* Within its range it will most probably be confused with *duplex, leechi, g. suavis, ovatus,* and *subsignatus.* It differs from *duplex* in having a dark venter, from *leechi* in the elytral pattern and a lighter pronotum, from *suavis* by lack of a metacoxal file and dark venter, and from *ovatus* by elytral pattern, dark venter, and simple margin of the last ventral segments in either sex. *L. subsignatus* appears to extend no farther north than Panama, and *laevipennis* may go no farther south than Costa Rica. They are extremely similar, however. At this time, it is not known if they are races of the same species.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — *L. o. laevipennis* has been collected from Jalisco to Costa Rica (fig. 26). Collections are also sparsely distributed in Oaxaca, Chiapas, and Nicaragua. It occurs in mountainous habitats in tropical deciduous forest. It is found in the same kind of habitats as *o. oscillator.*

MATERIAL EXAMINED

COSTA RICA. — San Jose, 1 ♂, vii.16.57, D. Lauck (USNM).

MEXICO. — **CHIAPAS.** Simojovel, 3 ♂, 1 ♀, viii.6.58, J. A. Chemsak (BERK). Cuahtemoc, 1 ♂, viii.30.63; Chiapa de Corzo, 3 ♂, 3 ♀, viii.28.63, JRZ (NMSU). **JALISCO.** Colima, 29 m. NE., 2 ♂, 1 ♀, xii.3.48, H. B. Leech (CAS). La Huerta, 6 m. S., 8 ♂, 4 ♀, xi.26.66; 9 m. S., 41 ♂, 40 ♀, x.26.66, A. Smith & JRZ (NMSU). **OAXACA.** Tapanatepec, 1 ♀, xii.31.55, J. C. Schaffner (UMMZ). Near El Cameron, Rd. 190, 2 ♂, viii.27.63, JRZ (NMSU).

NICARAGUA. — San Benito, 13 m. N., 3 ♀, vii.11.65; Somoto, 1 ♀, vii.28.65; Esteli, 9 m. N., 1 ♀, vii.10.65, P. J. Spangler (USNM).

Intergradation in Laccophilus oscillator

The only appreciable difference between the two races of *L. oscillator* is size; and there is, apparently, almost no overlap in that character. The northern race is nearly a millimeter longer (Table 24). Elytral pattern, color, and sexual characters are much the same. Populations in Nayarit, Jalisco, and Michoacan are clearly intermediate, however.

It is possible to show an almost complete conversion in less than fifty miles from a pure population of *laevipennis* to a nearly pure one of *oscillator* (fig. 27). The largest individuals barely exceed 3.9 mm, while unmixed populations of *oscillator* from Arizona and Michoacan have none or less than 4.1 mm. Although the data is conflicting, males and females appear to be about the same size in both races; and thus, the discussion can be simplified. The La Huerta sample has steep slopes and a well-defined peak when one plots the frequency distribution of length. Standard deviations are also relatively low (Table 24). Both are indicative of a homogenous population. Two other samples, from inland of that locality, show an interesting progression to a population that is predominately *oscillator*. Other samples in Nayarit and Michoacan represent a continuation toward *oscillator*. About twenty miles northeast of La Huerta near La Resolana (Casimiro Castillo), the population has a bimodal distribution with one peak at the same length as for *laevipennis* at La Huerta; but there is a second less definite one at about 4.2 mm which is closer to the mean for *oscillator*. Also, a few individuals fall in the intermediate size range of 3.9 to 4.1 mm. Continuing on to nine miles southwest of Autlan, the average length of the population has shifted to about 4.3 mm; and only a small percentage of the population is in the *laevipennis* size range. At this locality the size separation of the two races is almost completely obscured. Unfortunately, I do not have a sample from just a few more miles inland that would demonstrate a complete shift to *oscillator*. One must interpolate between the Autlan sample and those in Arizona and Michoacan. There are two samples from Michoacan. One, at Tzitzio, shows intergradation; but the other, at Uruapan, does not. The samples from Nayarit and Tzitzio are very similar to the one from Autlan.

The zone between the two races is probably due to secondary contact. Although there is a uniform gradation in size between them, the zone itself is extremely narrow. Ecological differences appear to be slight. Obviously, *oscillator* can tolerate cooler temperatures; but they are both found in rapidly flowing, shaded mountain streams.

MATERIAL EXAMINED

L. o. oscillator × *L. o. laevipennis*

MEXICO. — **JALISCO.** Autlan, 9 m. SW., 36 ♂, 27 ♀, x.24.66; La Resolana (Casimiro Castillo), 3 m. N., 71 ♂, 57 ♀, x.26.66, A. Smith & JRZ (NMSU). **MICHOACAN.** Tzitzio, 3 m. S., 7 ♂, 4 ♀, viii.22.63, JRZ (NMSU). **NAYARIT.** Tepic, 25 km. S., 1 ♀, ix.24.53, B. Malkin; Sierra de Zapotan, 1 ♂, 6 ♀, xi.—.42, E. Paredes (CAS).

LACCOPHILUS GENTILIS

This polytypic species is composed of three allopatric populations which are considered as two subspecies. *L. gentilis gentilis* LeConte is known from Florida to Louisiana. *L. g. suavis* Sharp occurs from Tamaulipas to Campeche and Costa Rica in a continuous series of populations. Another population extends from Colima to Sonora on the western side of the continent. It is unlikely that there is any real geographical separation between the last two groups, since there has been no intensive collecting for *Laccophilus* in the coastal regions of Michoacan, Guerrero, or western Oaxaca.

This species presents an interesting situation in the North American *Laccophilus* species, since the nominate race has virtually lost the metacoxal file that is still present in *suavis*. The species is well represented in the West Indies, but those populations are not considered here.

DESCRIPTION. — Small (length, 3.2 to 3.7 mm; width, 1.7 to 1.9 mm), reddish-brown species with or without a yellow, subbasal elytral fascia; metacoxal file present or absent; prosternal process long; ovipositor sawlike COLOR. *Head*: reddish-brown or yellowish-brown; appendages of matching color. *Pronotum*: generally yellowish-brown laterally, but much darker anteriorly between the eyes and posteriorly across the apical angle; discal region may be darkened to a lesser degree. *Elytra*: generally reddish-brown or brown with paler brownish-yellow or reddish-brown areas, especially subbasally; anterior part of epipleural pale, posterior darkened. *Tergite VIII*: pale yellowish- or reddish-brown. Abdomen usually darker. *Genitalia*: same as venter. ANATOMY. *Microreticulation*: double on head, pronotum, and elytra; primary mesh weak; surface shining. *Pronotum*: anterior margin covering the back of the eyes;

sides less convergent anteriorly than in most *Laccophilus*; WH/PW, 0.73; LP/PW, 0.38. *Elytra*: apices slightly truncated; female epipleura rarely, if ever, with flange. *Venter*: prosternal process long, extending beyond margin of mesocoxal cavities; metacoxal file present and of about 8 or 9 ridges in males and females of *suavis,* but these only suggested in *g. gentilis*; postcoxal processes nearly straight across, with lateral parts barely extending past the midline; last visible segment of males and females truncated; females less so and with emarginate apex; weak crest on male segment; a small tubercle on either side; females with fairly acute crest; in both sexes a row of thick, short hairs or setae on the lateral margins of segment. *Legs*: pro- and mesotarsi scarcely enlarged in a dorsoventral plane; fifth tarsal segment about twice as long as corresponding fourth on both pair of front legs; palettes difficult to distinguish at 20 power magnification; profemoral marginal setae (4 or 5) shorter and finer than mesofemoral ones (5 or 6). *Genitalia*: oval plate with produced acuminate tip; strongly asymmetrical; its ventral crest well developed, but interrupted about half the length of the plate; no raised lines on either side of crest; aedeagus with a crest on its convex side and resembling a bird's head in profile view; parameres relatively short, especially the left one when compared to the aedeagus; ovipositor with about 10 pair of sawlike teeth.

Laccophilus gentilis gentilis LeConte, new status (Figs. 260-267, 331)

Laccophilus gentilis LeConte, 1863, p. 23. *Type*: Museum of Comparative Zoology, number 5975, female, Wapler (collector?), Louisiana; Crotch, 1873, p. 400; Sharp, 1882a, p. 300; Leng and Mutchler, 1918, p. 78; Blatchley, 1919, p. 308; Leng, 1920, p. 77; Zimmermann, 1920, p. 19; Blatchley, 1932, p. 302; Young, 1954, p. 47.

DIAGNOSIS. — The largest individuals do not attain 4.0 mm, which makes this the smallest *Laccophilus* in the United States. *L. g. gentilis, L. undatus,* and *L. schwarzi* are all non-irrorated, but the last two exceed 4.0 mm and occur no farther south than Virginia. Both of these species have prominent yellow elytral markings that are lacking on this race of *gentilis.* The elongate prosternal process and spines on last ventral segment will also separate *g. gentilis* from any other United States species. The principal difference between *g. gentilis* and *g. suavis* is that a file and yellow subbasal elytral band are present in the latter and not in the former.

NOMENCLATURAL NOTES. — There has been no confusion of *gentilis* with other species. The close relationship between it and *suavis* has not been previously recognized. The two differ in elytral patterns and in the presence of a file in one, but not the other. In both traits there is evidence of relationship, however. The same basic pattern is present in both, but the lighter areas are reddish in *gentilis* and usually yellow in *suavis.* There is a trace of the file in *gentilis,*

Table 25. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus gentilis*.

Locality		N	length		elytral length		(N)	width		pronotal width		PW/EL	t_{95}
							Laccophilus g. gentilis						
Florida	♂	11	3.38	0.060	2.65	0.053	....	1.75	0.045	1.48	0.028	0.558	.....
	♀	22	3.46	0.102	2.73	0.095	....	1.80	0.059	1.52	0.039	0.557	0.0059
							Laccophilus g. suavis						
Veracruz	♂	13	3.40	0.120	2.70	0.084	(6)	1.78	0.059	1.45	0.052	0.538	0.0055
	♀	19	3.53	0.129	2.78	0.097	(17)	1.84	0.077	1.52	0.068	0.550	0.0054
Nayarit	♂	9	3.49	0.116	2.78	0.086	(8)	1.81	0.088	1.50	0.066	0.540	.....
	♀	13	3.54	0.131	2.81	0.102	....	1.86	0.055	1.53	0.043	0.545	0.0072

if one examines the metacoxal plate carefully; and the file is weak in *suavis* and has been reduced to less than ten lines. Sexual characters are much the same in both. There is no test of sympatry, since their ranges are widely separated. More intensive collecting in coastal regions of Tamaulipas and Texas might show connecting and intergrading populations, however. It seems fairly certain that this species has representatives on several Caribbean islands, but I have not examined enough material to make nomenclatural conclusions about those.

VARIATION. — There is considerable individual variation in the degree to which the irregular reddish markings occur as spots or bands extending over the surface of the elytra. The reddish markings correspond to yellow ones in *suavis.* There is also some variation in the amount of darkening present upon the pronotum.

Females are slightly larger than males (Table 25). From a sample of 22 females and 11 males, the means for total length were 3.46 and 3.38. The largest female in the sample is 3.64 mm long, and the largest male is 3.48 mm long.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — Young (1954) states that *gentilis* occurs in Florida almost throughout the peninsula, but not west of the Apalachicola River (fig. 23). There are also two records from southern Georgia and one from Louisiana. The type was described from Louisiana. Its known range is well removed from the nearest record of *suavis,* which is southern Tamaulipas.

Young says that in northcentral Florida it is most abundant in sloughs or swamps along the edges of lakes. It more rarely is found in small streams and various kinds of ponds. I have not collected this subspecies.

MATERIAL EXAMINED

UNITED STATES OF AMERICA. — **FLORIDA.** *Alachua County.* New Man's Lake, 5, iv.12.25, M. D. Leonard (CML). Gainesville, 2 ♂, 2 ♀, vi.23.59, R. E. Woodruff (MCZ). *Dade County.* 5, vii.18.38 (CNL). Homestead, 1 ♀, vii.27.57, R. M. Baronowski (CAS); 1 ♂, 2 ♀, vi.—.29, Darlington (MCZ). *Duval County.* Jacksonville, 1, 8.—.02 (USNM). *Flagler County.* Crescent City, 2 (USNM). *Hendry County.* LaBelle, 2, ii.26.18, W. S. Blatchley (USNM). *Hernando County.* Croom, 6 ♀, vi.18.29, P. J. Darlington (MCZ). *Highlands County.* Brighton, 5 ♂, 4 ♀, vi.16.29, Darlington (MCZ). Boundary of *Okeechobee County* & *Glades County,* Mouth of Kissimmee River, 1, iv.6.39, J. C. Bradley (CNL). *Orange County.* Winter Park, 1 ♂, viii.8.40,

H. T. Fernald (MCZ) *Pinellas County.* Dunedin, 2, iv.17.25; 1, i.16.18; 1, iii.15.18; 1, x.1.17; 1, iii.28.18; 2, iv.17.25, W. S. Blatchley (USNM). 2, ii.22.22 (CNL). *Sarasota County.* Sarasota, 1 ♂, 2 ♀, —.—.11, W. S. Blatchley (MCZ). *Taylor County,* 1 (USNM). **GEORGIA.** *Charlton County.* Okefenokee Swamp, Bog, 1, xii.26.13 (CNL). *Jefferson County.* Wrens, 1, iii.8.11 (CNL); 1 (ANSP). **LOUISIANA.** *Vermillion County.* Gueydan (light), 1, vii.—.25, E. Kalmbach (USNM). Gueydan, 1, vii.11.25, Wapler (collector?), 1 ♀ (MCZ).

Laccophilus gentilis suavis Sharp, new status (Fig. 332)

Laccophilus suavis Sharp, 1882b, p. 13. *Type*: British Museum (Natural History), male, Cordova, Veracruz; Zimmermann, 1920, p. 26; Blackwelder, 1944, p. 74.

Laccophilus championi Sharp, 1882b, p. 14. *Type*: British Museum (Natural History), male, Paso Antonio, Guatemala; Zimmermann, 1920, p. 17; Blackwelder, 1944, p. 74. **(New synonym.)**

DIAGNOSIS. — This is the only North American *Laccophilus* that has a metacoxal file and a long prosternal process. *L. ovatus* has an equally long process, but no file. The two are also about the same size (average length about 3.5 mm) and have similar reddish-brown elytra with yellow subbasal markings that form a complete band in *suavis,* but may be interrupted in *ovatus.* The reddish-brown pigment is more uniformly applied in *suavis* than in *ovatus. L. duplex* and *L. oscillator* have similar patterns, but are larger species (about 4.0 mm or longer), lack files, have shorter prosternal processes, and have untruncated last ventral abdominal segments. The last ventral segments of *suavis* and *ovatus* are similarly ornamented with lateral spines, small protuberances, and emarginate apices in the females. *L. g. suavis* males and females lack the prominent produced apices of *ovatus.* The aedeagi of the two species are quite different, however.

NOMENCLATURAL NOTES. — The reason for reducing *suavis* was discussed under *gentilis,* but it is also necessary to synonymize *championi* Sharp with *suavis.* The former was described from Guatemala and the latter from Cordova, Veracruz. I have examined cotypes (= paratypes) of both from those localities and find the differences to be individual and not geographical. Page precedence establishes the priority of *suavis.*

VARIATION. — The extent of the yellow on the subbasal band, the midlateral spot, and the postmedian markings are the most apparent variations in color and pattern. There is always some yellow or reddish-yellow color at all of these positions, but considerable reduction sometimes occurs. Some specimens have darker, more extensive pronotal marks than others, with darkening reaching clear across the

disc. The reddish-brown on the elytra may darken in some to very dark brown. Specimens from the west coast of Mexico are darker reddish-brown than those from Veracruz, with more contrast between light and dark areas.

As in *gentilis,* the females appear to be larger than the males. There is close agreement also in the populations from Veracruz and those from Nayarit (Table 25). The EL/PW ratio varies from 0.538 to 0.550. This race is larger than *gentilis* (fig. 24).

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — This is a tropical lowland *Laccophilus.* Its range is probably continuous from southern Tamaulipas on the northeast and southern Sonora on the northwest to El Salvador or farther into Central America (fig. 23). The large gap between Colima and the Isthmus of Tehuantepec is undoubtedly due to a lack of collecting. On the east coast, it has a gap between southern Tamaulipas and central Veracruz, but this is also another poorly collected area.

It was mostly collected in still water on the coastal plain. It occurs in grassy-bottomed or mud-bottomed pools that form in roadside excavations, or in duckweed-choked, shaded sloughs, or in pools of stabilized dunes immediately next to the ocean. On a few occasions, it was at several thousand feet, however. There is one record near Zamora, Michoacan (over 5000 feet), and several from the vicinity of Tepic, Nayarit (3000 feet), which indicate it readily migrates over wide areas. I have not yet been able to collect *suavis* in large numbers, probably because of not finding its preferred habitat.

MATERIAL EXAMINED

MEXICO. — **CAMPECHE.** Champoton, 19 m. S., 10 ♂, 14 ♀, vii.26.64, P. J. Spangler (USNM); 11 m. W., 1 ♂, 1 ♀, xi.27.63; Cuidad de Carmen, 4 m. E., 1 ♂, xi.27.63, JRZ (NMSU). **CHIAPAS.** Cintalapa, 5 m. W., 1 ♂, ix.1.63, JRZ (NMSU). **COLIMA.** Manzanillo, 5 m. S., 5 ♂, 1 ♀, vii.29.62, JRZ (NMSU). **JALISCO.** Barra de Navidad, 2 ♂, 1 ♀, i.22.61, C. O. Morse (CAS); 1 ♂, 5 ♀, x.25.66; La Huerta, 1 ♂, x.25.66, A. Smith & JRZ (NMSU). **NAYARIT.** Pena, 12 m. N., 1 ♀, xi.26.48, H. B. Leech (CAS). Tepic, 1 ♂, 1 ♀, ix.15-17.53; 1 ♂, 1 ♀, ix.21-24.53, B. Malkin; 5 m. SE., 2 ♀, ix.26.48, H. B. Leech; San Blas, 1 ♂, ix.28.61, C O. Morse; 2 ♂, 1 ♀, xi.7.58, I. Moore (CAS); 5 m. E., 7 ♂, 10 ♀, vii.31.62, JRZ (NMSU). **MICHOACAN.** Zamora, 9 m. W., 1 ♂, xii.6.48, H. B. Leech (CAS). **OAXACA.** Tehuantepec, 1 ♂, 1 ♀, ix.6.64, JRZ (NMSU). **QUINTANA ROO.** Cozumel Island, Celarain Point, 1 ♂, iv.21.60; San Miguel, 2 m. N., 1 ♂, 3 ♀, iv.3.60, J. F. G. Clarke

(USNM). **SINALOA.** Mazatlan, 1 ♂, viii.14.60, Arnaud, Ross, Rentz (CAS); 7 m. S., 1 ♂, xii.11.62, JRZ (NMSU). Pericos, 26 m. N., 1 ♂, viii.13.60, Arnaud, Ross, Rentz (CAS). **TABASCO.** Villahermosa, 1 ♂, 3 ♀, vii.25.64; 23 m. N., 1 ♂, 4 ♀, viii.6.64, P. J. Spangler (USNM); 5 m. S., 2 ♀, xi.26.63, JRZ (NMSU). **TAMAULIPAS.** Mante, 1 ♂, iii.23.63, JRZ (NMSU). **VERACRUZ.** Acayucan, 20 m. S., 1 ♂, ix.7.64; Alvarado, 10 m. W., 5 ♂, 6 ♀, JRZ (NMSU). Cuitlahuac, 1 ♂, 2 ♀, viii.10-12.64, P. J. Spangler (USNM). Jalapa, 10 m. E., 9 ♂, 4 ♀, vii.27.62, JRZ (NMSU). J. D. Covarrubia, 1 m. N., 5 ♂, 6 ♀, viii.26.62, P. J. Spangler (USNM). Near Garro, 2 ♂, 6 ♀, ix.8.64; Santiago Tuxtla, 10 km. S., 1 ♂, 1 ♀, ix.8.64, JRZ (NMSU). Tres Zapotes, 1 ♂, iv.11.39, A. Wetmore (USNM). Veracruz, 14 m. SE., 1 ♂, vi.16.58, J. C. Schaffner (UMMZ). Cordova, 1 ♂, cotype, B. C. A. Coll. (BM).

BRITISH HONDURAS. — 1 ♂, —.—.05 (BM).

EL SALVADOR. — Acajutla, 19 m. W., 1 ♂, vii.8.65; La Union, 15 m. SW., 2 ♂, 4 ♀, vii.31.65; Metalio, 1 ♂, 4 ♀, viii.4.65; Cd. Arce, 7 m. SE., 4 ♂, 6 ♀, viii.3.65, P. J. Spangler (USNM).

CUBA. — Camaguey, Baragua, 1 ♂, vi.5.32, Christenson; Cayanas, 1 ♂, viii.5.08; 1 ♂, ix.5.—; 1 ♀, i.6.—, E. H. Schwarz (USNM).

COSTA RICA. — 1 ♀, ii.8.28; 1 ♀, iii.26.36, F. Nevermann; Taboga Agr. Exp. Sta., 2 ♂, 3 ♀, vi.27.67, P. J. Spangler (USNM).

GUATEMALA. — Paso Antonio, 2 ♂, B. C. A. Coll. (BM).

PANAMA. — Gamboa, 4 m. W., 1 ♀, vii.6.67, P. J. Spangler (USNM).

Laccophilus ovatus zapotecus, new subspecies (Figs. 268-275, 330, 331)

DIAGNOSIS. — This race differs from the one in South America in the aedeagus and in the presence of a nearly complete subbasal elytral band instead of a few, indistinct yellow markings at that position. The aedeagus of the nominate race is more gracefully ballet-footed; *L. o. zapotecus* differs from *L. gentilis suavis* in the absence of a file in the male and in the slightly different shape of the male and female last ventral segments. *L. ovatus* is more parallel-sided, due to the longer widened anterior portion of the female epipleura. *L. duplex, L. oscillator, L. gentilis, suavis,* and *L. ovatus zapotecus* have subbasal bands, mid-lateral spots, and several post-median marks on the elytra; but *oscillator,* and sometimes *duplex,* are dark beneath and both longer and broader. The patterns of *zapotecus* and *g. suavis* are very similar, but that of *zapotecus* is more unevenly marmorated, and has a greater concentration of dark pigment next to the yellow marks. Sexual characters are better than pattern for separating these two sympatric species.

DESCRIPTION. — Small (length, 3.25 to 3.75 mm; width, 1.75 to 1.95 mm), reddish-brown subspecies (and species), marked with yellow subbasal elytral band; metacoxal file absent, prosternal process long; ovipositor sawlike.

COLOR. *Head*: entirely pale brownish-yellow (sometimes tinged with red) above and beneath. *Pronotum*: generally same as the head, but anteriorly a pair of merged reddish-brown markings and a darker mark at the posterior apex; entire posterior margin translucently reddish-brown. *Elytra*: marmorated reddish-brown with pale yellowish-brown markings; anterior half of the epipleura pale, posterior half darkened. *Tergite VIII*: brown. *Venter*: entirely pale brownish-yellow, sometimes tinged with red, especially the hind legs. *Genitalia*: variably reddish-yellow brown. *ANATOMY. Microreticulation*: double on head, pronotum, and elytra with individual cellules weakly impressed; surface shining. *Head*: supraclypeal seam arching slightly upward at midline. *Pronotum*: WP/PW, 0.73; LP/PW, 0.39. *Elytra*: apices slightly truncated; female epipleura not narrowed until level of posterior margin of second abdominal segment instead of anterior to the posterior margin of the first segment. *Venter*: prosternal process long with apex extending beyond imaginary line drawn across posterior margins of hind coxae; process with well-defined crest; postcoxal processes truncated along the posterior margins, but emarginate at the midline; last abdominal segment in both sexes truncated but with produced apex; female apex emarginate with ventral crest; males with asymmetrical irregular median crest and a darkened, sclerotized oblique ridge on the left side; both sexes with multiple rows of thick, short spines on the lateral margins of the last three abdominal segments of the venter and on the female valves (Sternite VIII) on either side of the ovipositor. *Legs*: pro- and mesolegs enlarged in a dorsoventral plane; fifth segment about one and two-thirds as long as corresponding fourth; claws nearly as long as its corresponding fifth segment; palettes easily visible at 20 power magnification; profemoral setae (6) nearly as long, but thinner than mesofemoral ones (6 or 7). *Genitalia*: oval plate with produced acuminate tip; its ventral crest raised, well-defined, curving slightly to the left anteriorly; some weak raised lines on the right side; aedeagus flattened with profile resembling a dancer's leg; right paramere with produced apex and nearly as long as left; ovipositor with about 14 very fine sawlike teeth.

NOMENCLATURAL NOTES. — While this race is similar to the Brazilian population, there are several differences which support subspecific rank. The range is too incompletely known, however, to determine whether they are allopatric populations, or if there is an intergrade zone between them, or if they overlap as separate species.

VARIATION. — The most obvious variation in pattern is the extent to which the elytral subbasal band is interrupted. In Tabasco specimens the band is complete; but in some in Chiapas, there are three discrete marks which is an intermediate condition to the only specimen (a male cotype) from Brazil that I have examined.

Males and females seem to be about the same length (Table 26, fig. 24). A total of 23 females had a mean length of 3.53 mm, and

Table 26. Variation ($\bar{X}$ mm ± SD) in four measurements and in the ratio of pronotal width divided by elytral length (with 95% confidence interval) in *Laccophilus ovatus zapotecus*.

Locality		N	length	elytral length	(N)	width	pronotal width	PW/EL	t_{95}
J. D. Covarrubia, Veracruz	♀	7	3.49 0.131	2.81 0.108	.....	1.84 0.082	1.50 0.058	0.533	0.0070
Villahermosa, Tabasco	♂	10	3.62 0.130	2.89 0.089	(7)	1.86 0.029	1.53 0.023	0.528	0.0075
	♀	7	3.60 0.088	2.83 0.074	.....	1.90 0.037	1.54 0.039	0.546	0.0150
Huixtla, Chiapas	♂	9	3.55 0.105	2.81 0.083	.....	1.85 0.059	1.49 0.044	0.530	0.0070
	♀	9	3.52 0.082	2.82 0.065	.....	1.87 0.060	1.51 0.037	0.535	0.0074

one of 19 males had a mean of 3.58 mm. There is little difference in the values from three localities; one in Veracruz, another in Tabasco, and the third in Chiapas. Females may be slightly broader than males, however; and this is indicated by PW/EL ratio. The one Brazilian specimen that I have examined had a length of only 3.25 mm, which is smaller than the smallest individual from the Mexican localities.

GEOGRAPHICAL RANGE AND HABITAT PREFERENCES. — The northern limit of the range of this race is about the Isthmus of Tehuantepec. The southern limit is not known, but it reaches Panama (fig. 17). All localities are under 500 feet elevation. It was found mostly in pasture ponds and in roadside ditches with mud bottoms.

MATERIAL EXAMINED

Holotype male, *allotype* female, and a male and female paratype with the following locality data are in the United States Nationl Museum: 5 miles south of Villahermosa, Tabasco, xi.26.63, J. R. Zimmerman. A male paratype with the same data as the holotype is in the California Academy of Sciences, San Francisco, and a male and female with the same data are each in the University of Michigan Museum of Zoology, Ann Arbor, and the Departmento de Entomologia, Laboratorio de Sanidad Vegetal, Coyoacan, D. F., Mexico. Another female paratype from one mile north, J. D. Covarrubia, Veracruz, viii.26.62, J. R. Zimmerman, is also in the California Academy of Sciences.

COSTA RICA. — Toboga Agr. Exp. Sta., 4 ♂, vi.27.67; 1 ♂, 2 ♀, v.28.67, P. J. Spangler (USNM). La Cruz, 16 m. S., 3 ♂, 1 ♀, vii.13.65, P. J. Spangler (USNM).

GUATEMALA. — Paso Antonio, 2 ♀, Champion, B. C. A. Coll. (BM).

NICARAGUA. — Rivas, 22 m. S., 1 ♂, vii.26.65, P. J. Spangler (USNM).

PANAMA. — Algarrobos, 9 m. W., 8 ♂, 9 ♀, vii.5.67; Gamboa, 4 m. W., 4 ♂, 8 ♂, vii.6.67, P. J. Spangler (USNM); Jarones, 1 ♂, 2 ♀, vii.5.67; Las Lajas, 4.8 m. NW., 2 ♂, 2 ♀, vii.5.67, P. J. Spangler (USNM).

MEXICO. — **CHIAPAS.** Huixtla, 5 m. NW., 10 ♂, 9 ♀, viii.22.65, P. J. Spangler (USNM). **TABASCO.** Villahermosa, 5 m. S., 6 ♂, 4 ♀, xi.26.63, JRZ (NMSU). **VERACRUZ.** J. D. Covarrubia, 6 ♀, vii.26.62; Paso del Toro, 1 ♂, viii.25.62, JRZ (NMSU).

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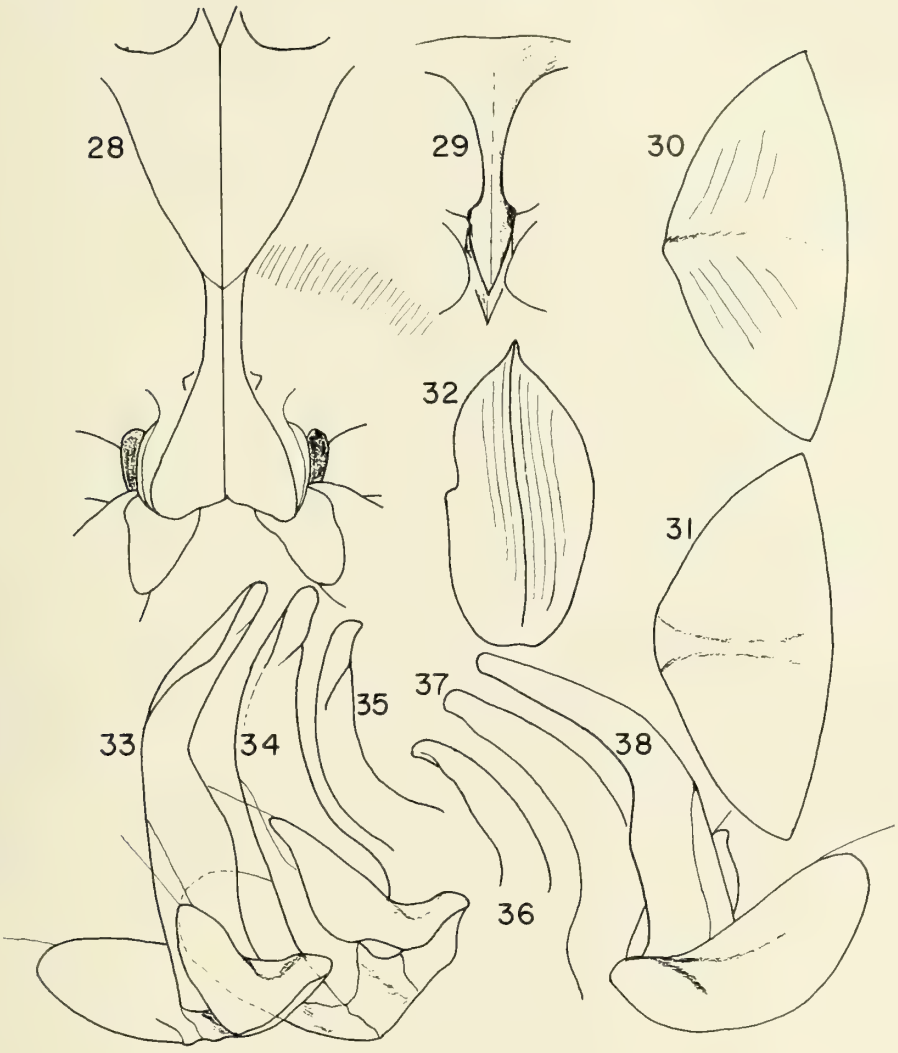
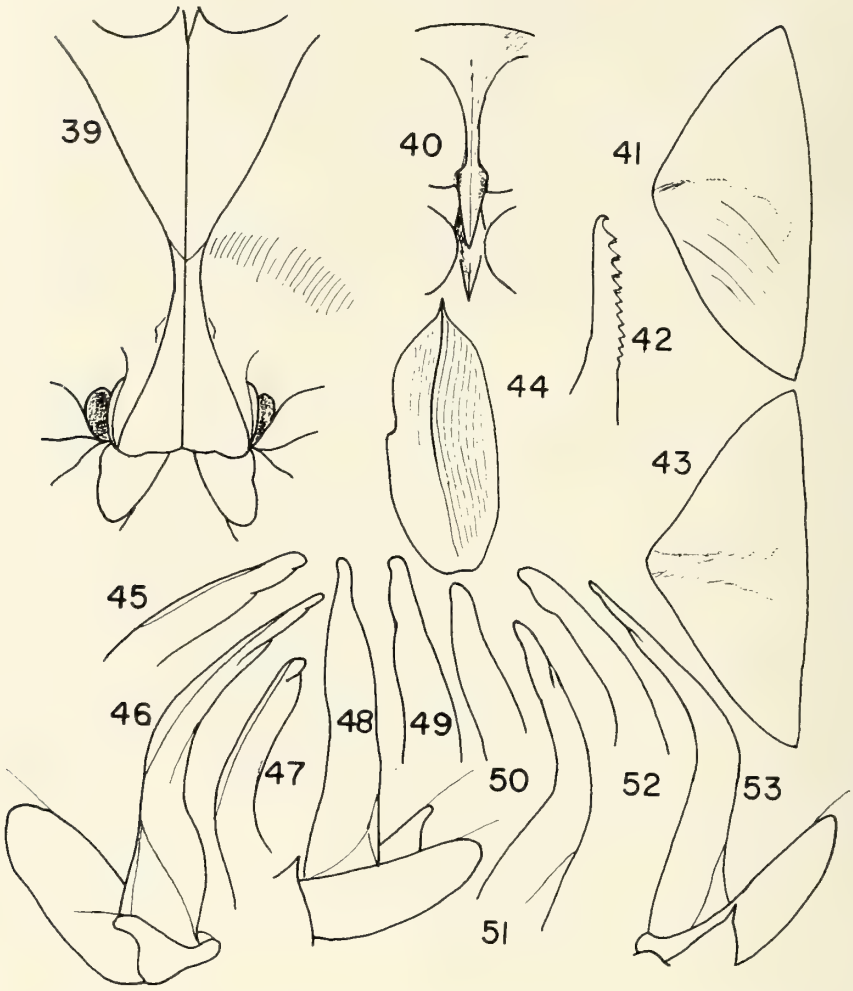
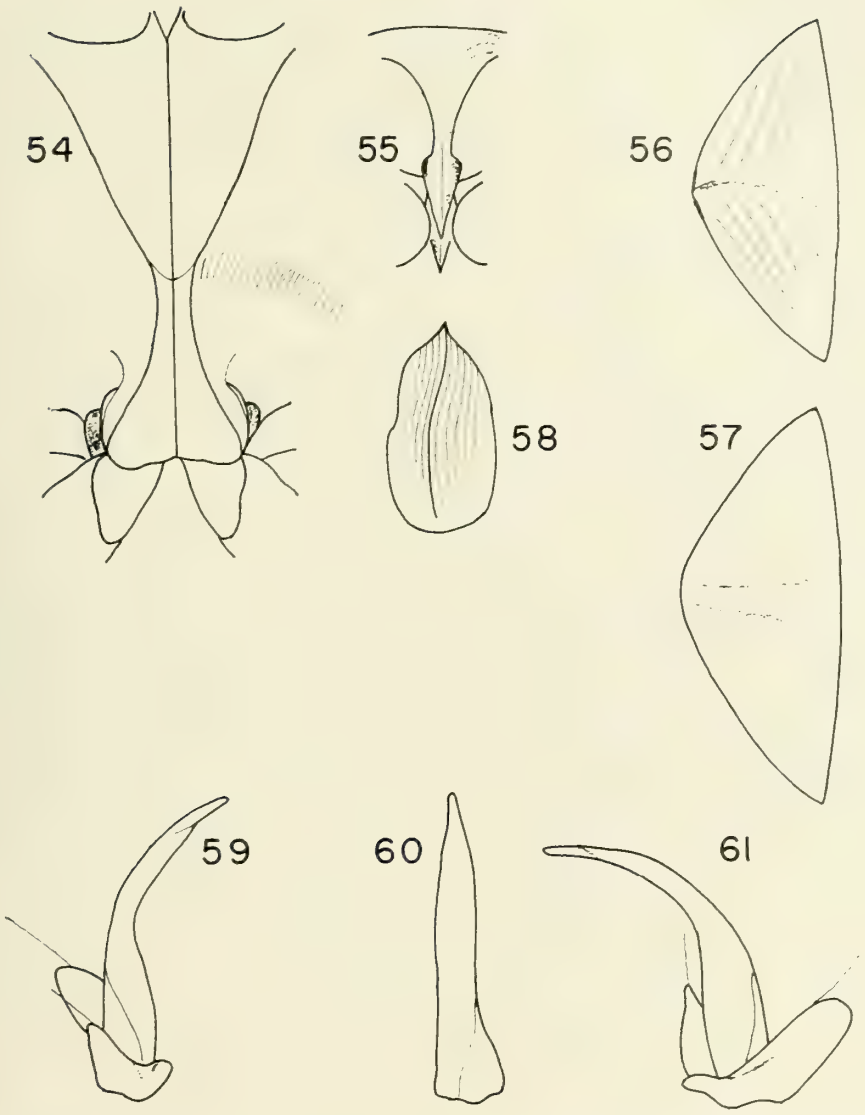


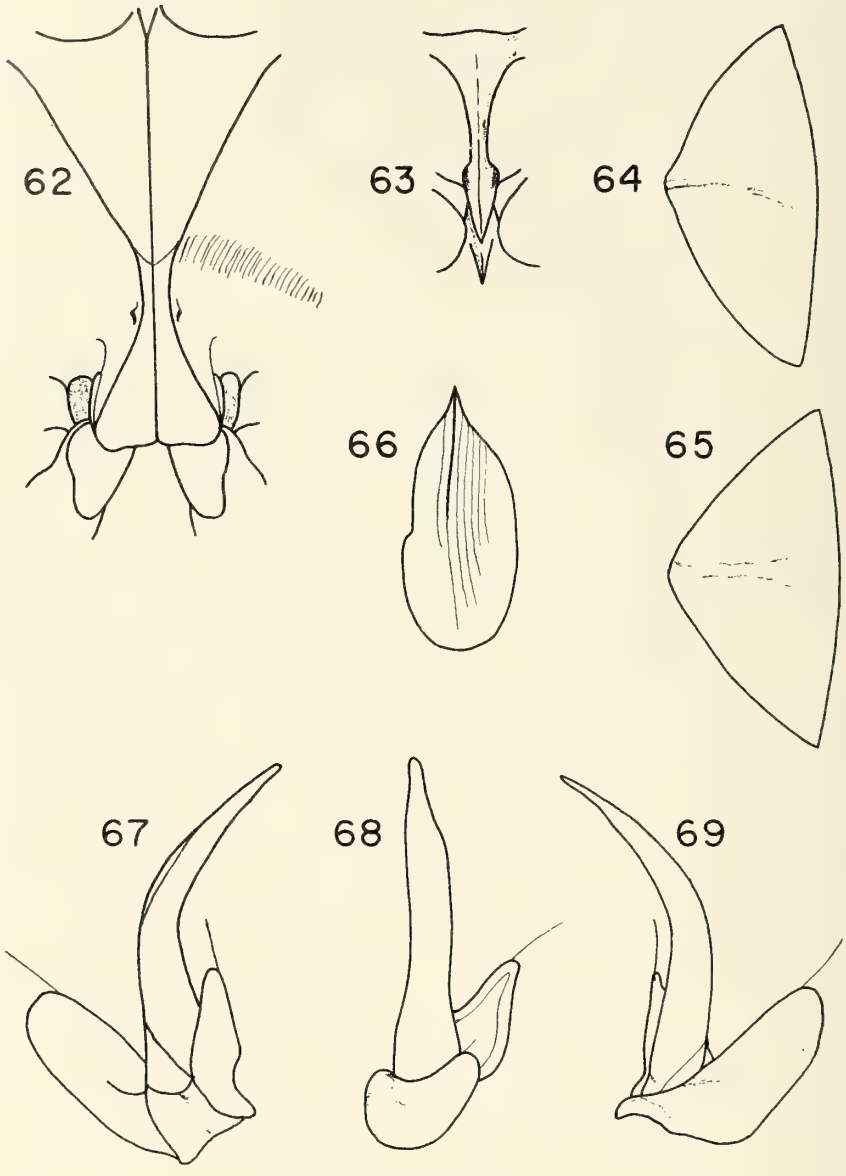
Figures 28-38. *Laccophilus maculosus*: 28, ventral view of male metasternum, metacoxal file, and postcoxal processes; 29, prosternal process; 30, male last ventral segment; 31, female last ventral segment; 32, male oval plate; 33, lateral view of aedeagus and parameres of *L. m. maculosus*; 34, lateral view of aedeagus and parameres of *L. m. decipiens*; 35, lateral view of distal half of aedeagus of *L. m. shermani*; 36, dorso-lateral view of distal half of aedeagus of *L. m. shermani*; 37, dorso-lateral view of aedeagus of *L. m. decipiens*; 38, dorso-lateral view of aedeagus and parameres of *L. m. maculosus*.



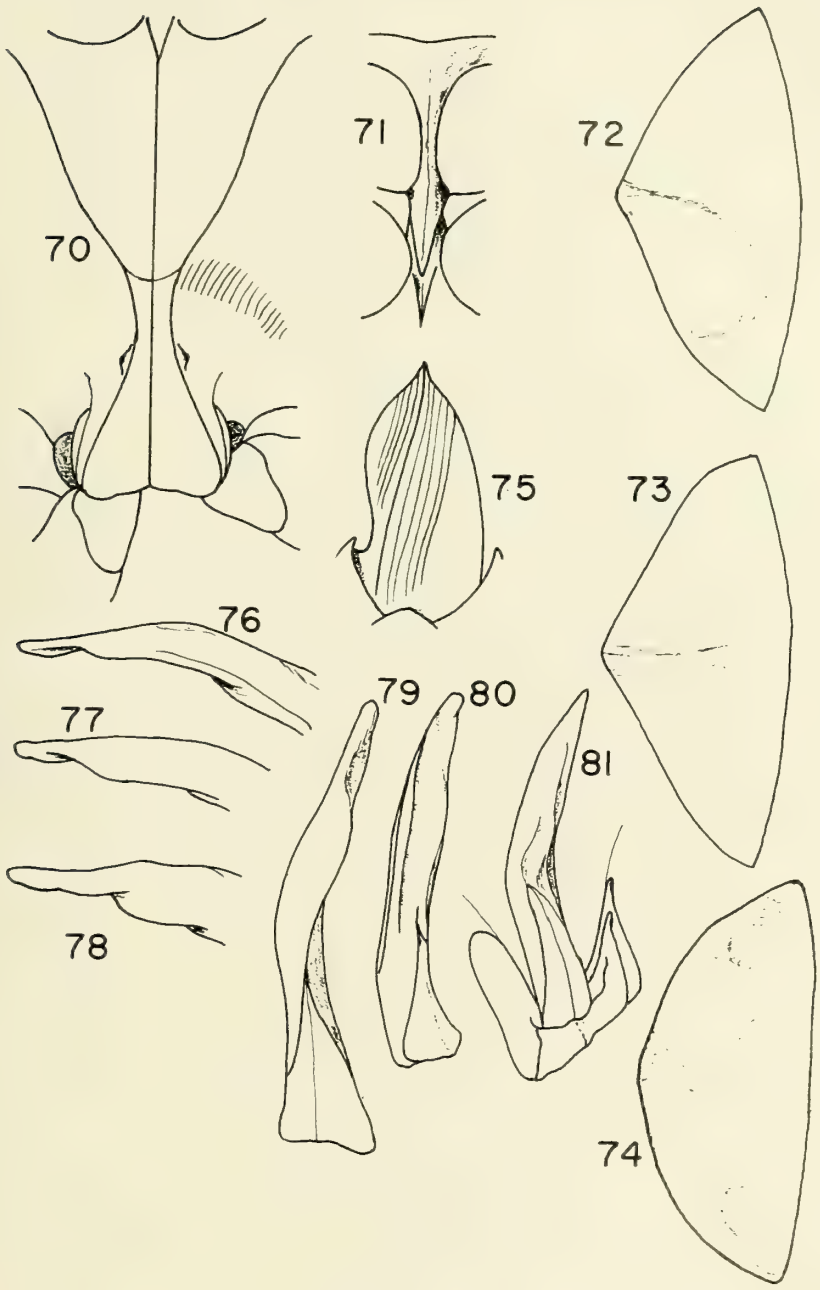
Figures 39-53. *Laccophilus fasciatus*: 39, ventral view of male metasternum, metacoxal file, and postcoxal processes; 40, prosternal process; 41, male last ventral segment; 42, lateral view of ovipositor; 43, female last ventral segment; 44, male oval plate; 45, right lateral view of distal half of aedeagus of *L. f. rufus*; 46, right lateral view of aedeagus and parameres of *L. f. terminalis*; 47, right lateral view of distal half of aedeagus of *L. f. fasciatus*; 48, dorsal view of aedeagus and parameres of *L. f. terminalis*; 49, dorsal view of distal half of aedeagus of *L. f. rufus*; 50, dorsal view of distal half of aedeagus of *L. f. fasciatus*; 51, left lateral view of aedeagus of *L. f. fasciatus*; 52, left lateral view of distal half of aedeagus of *L. f. rufus*; 53, left lateral view of aedeagus and left paramere of *L. f. terminalis*.



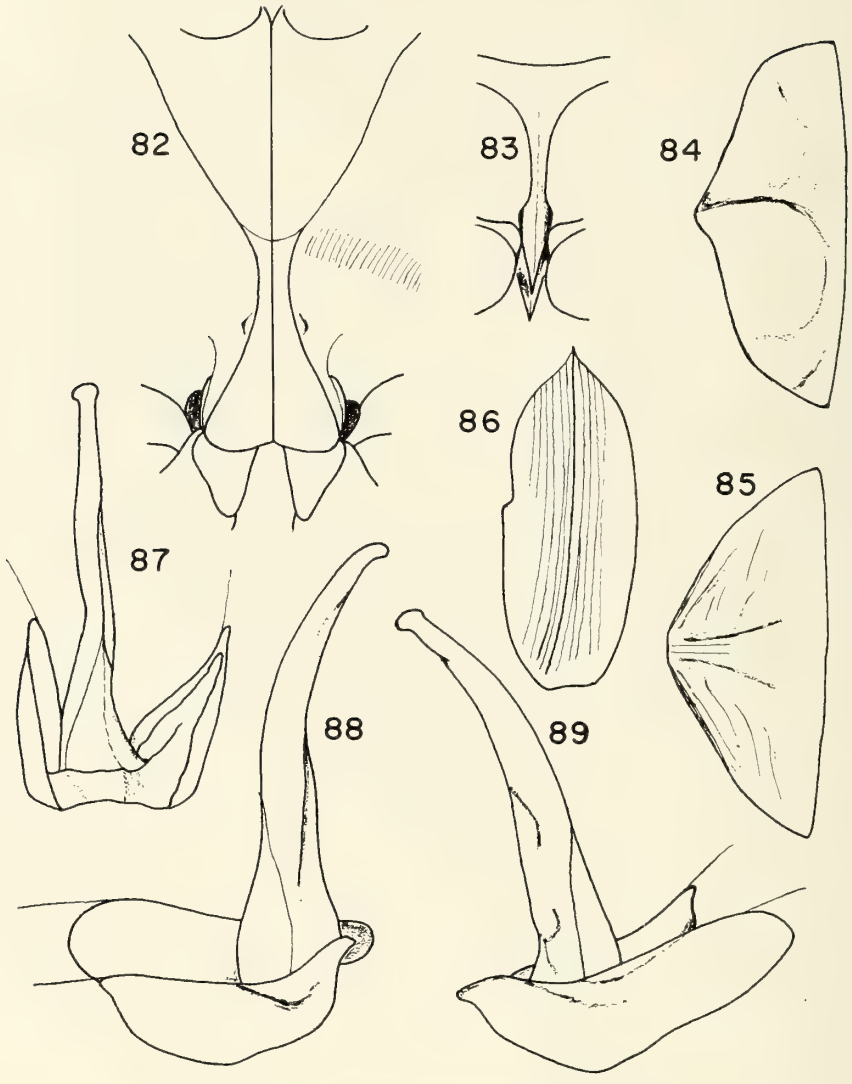
Figures 54-61. *Laccophilus proximus*: 54, ventral view of male metasternum, metacoxal file, and postcoxal processes; 55, prosternal process; 56, male last ventral segment; 57, female last ventral segment; 58, male oval plate; 59-61, right lateral, dorsal, and left lateral view of aedeagus and parameres.



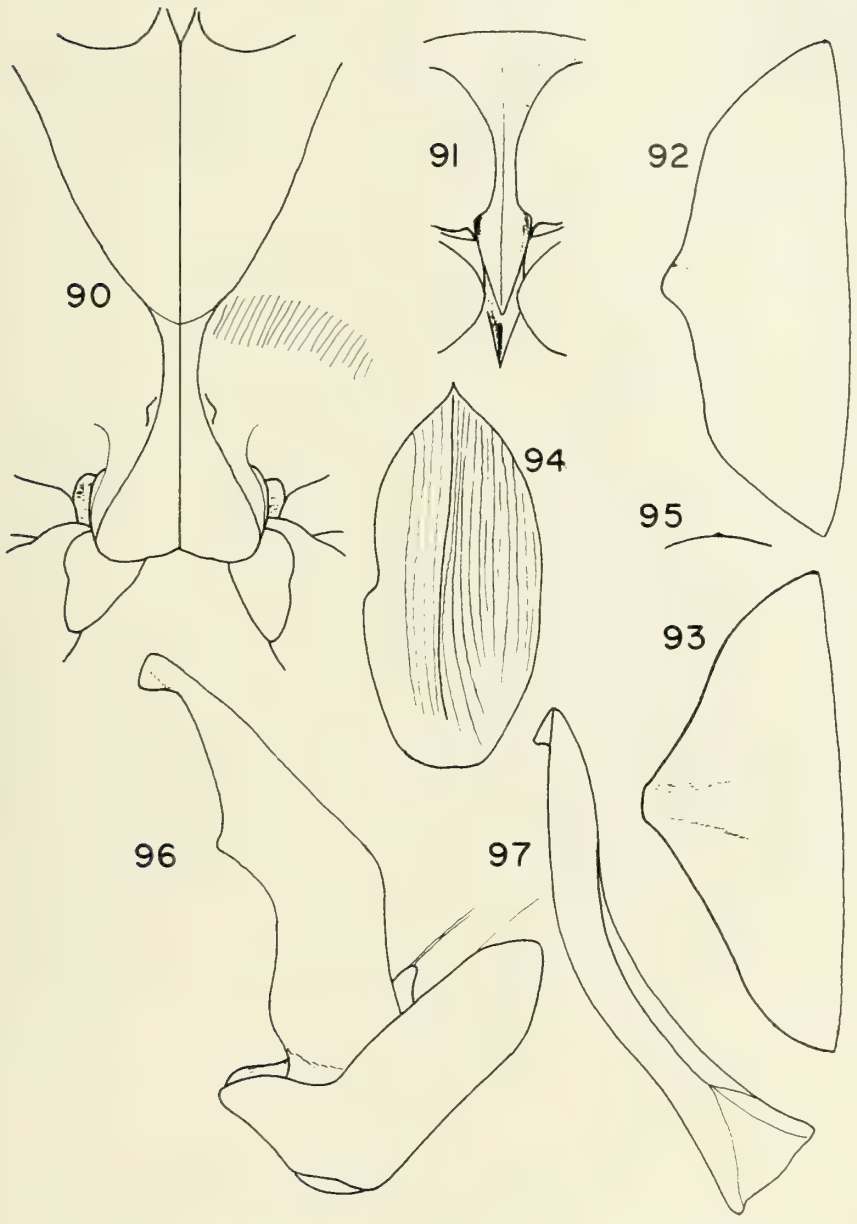
Figures 62-69. *Laccophilus salvini*: 62, ventral view of male metasternum, metacoxal file, and postcoxal processes; 63, prosternal process; 64, male last ventral segment; 65, female last ventral segment; 66, male oval plate; 67-69, right lateral view, dorsal view, and left lateral view of aedeagus and parameres.



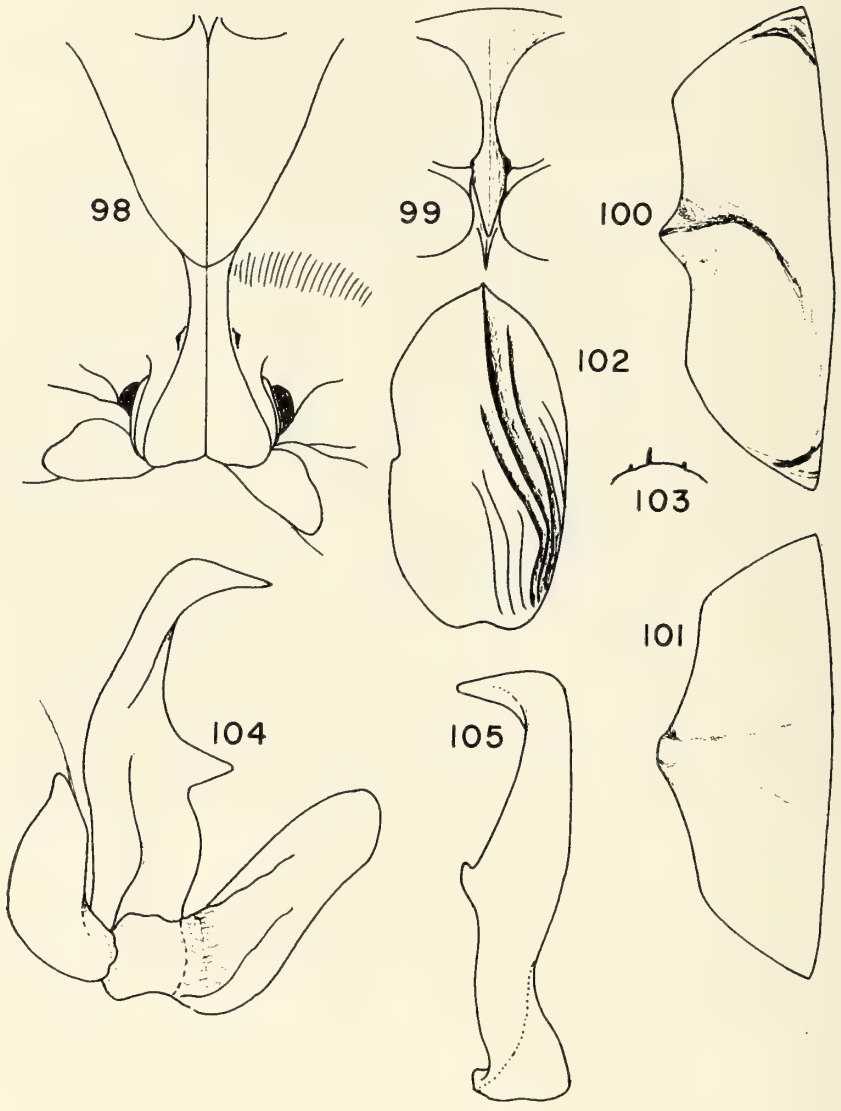
Figures 70-81. *Laccophilus mexicanus*: 70, ventral view of metasternum, metacoxal file, and postcoxal processes; 71, prosternal process; 72, male last ventral segment of *L. m. mexicanus*; 73, female last ventral segment of *L. m. mexicanus*; 74, female last ventral segment of *L. m. oaxacensis*; 75, male oval plate, 76-78, left lateral views of the distal half of aedeagi of *L. m. mexicanus, L. m. atristernalis, L. m. oaxacensis*; 79-81, dorsal view of aedeagi and parameres of *L. m. oaxacensis, L. m. atristernalis,* and *L. m. mexicanus.*



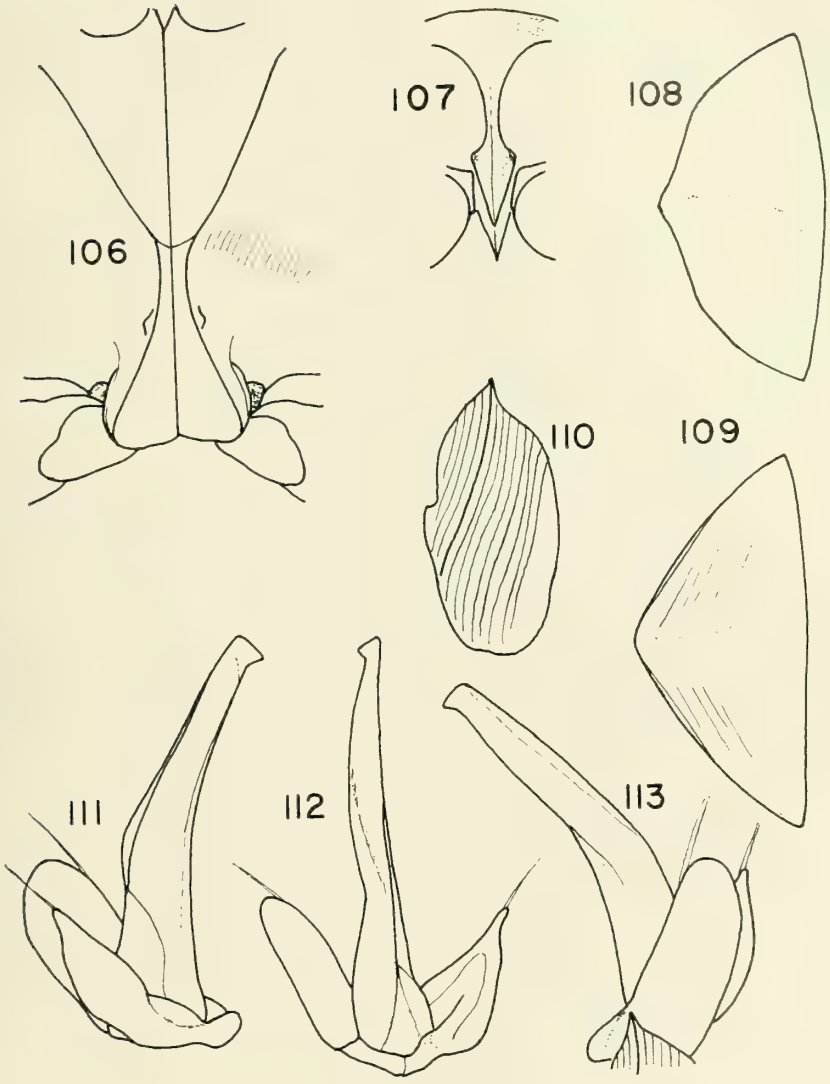
Figures 82-89. *Laccophilus pseudomexicanus*: 82, ventral view of metasternum, metacoxal file, and postcoxal processes; 83, prosternal process; 84, male last ventral segment; 85, female last ventral segment; 86, male oval plate, 87-89, dorsal, right lateral, and left lateral views of aedeagus and parameres.



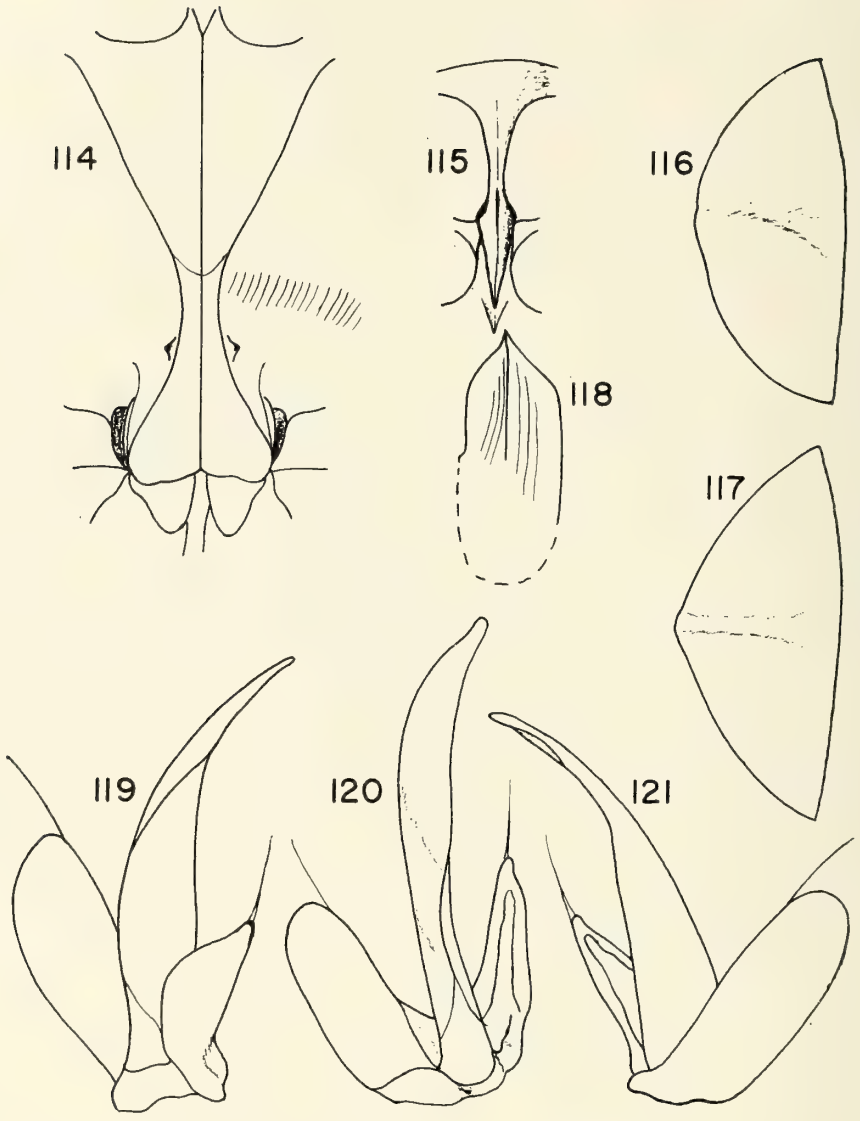
Figures 90-97. *Laccophilus mistecus*: 90, ventral view of metasternum, metacoxal file, and postcoxal processes; 91, prosternal process; 92, male last ventral segment; 93, female last ventral segment; 94, oval plate; 95, c. x. through oval plate showing ventral crest; 96-97, left lateral and dorsal views of aedeagus and parameres.



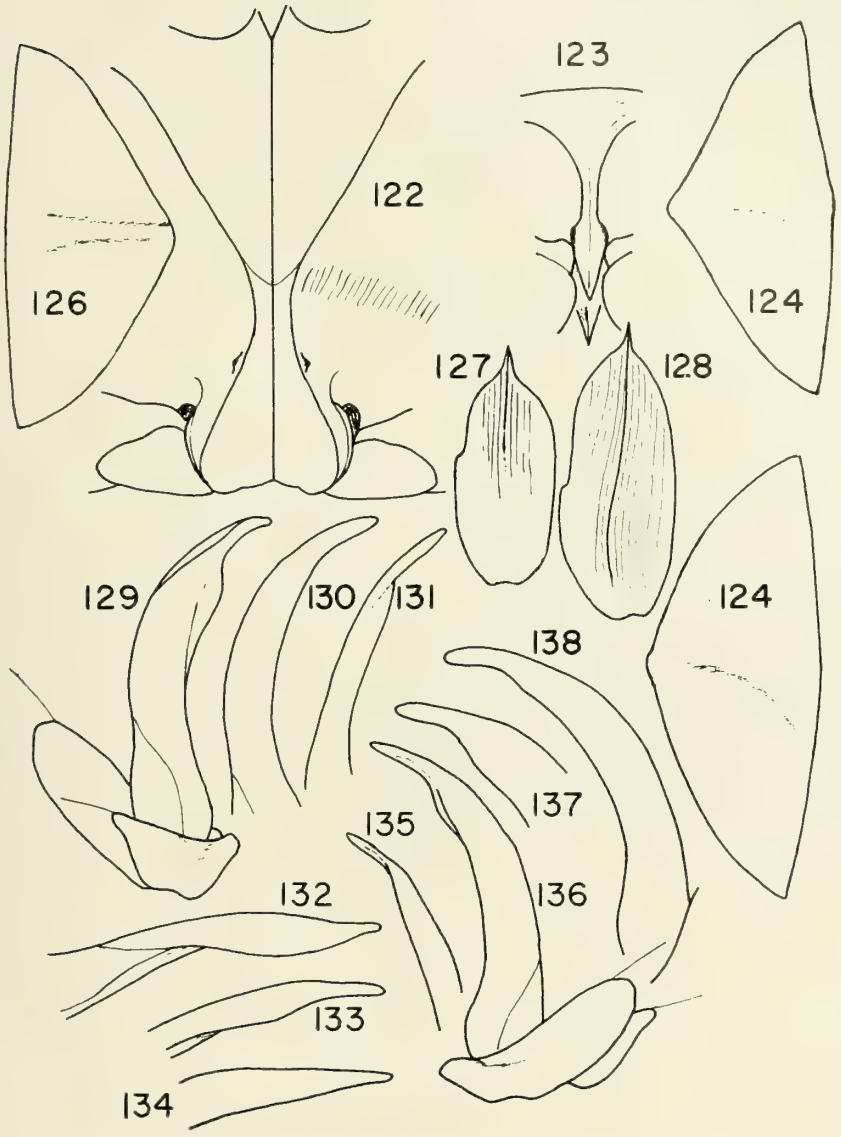
Figures 98-105. *Laccophilus spergatus*: 98, ventral view of metasternum, metacoxal file, and postcoxal processes; 99, prosternal process; 100, male last ventral segment; 101, female last ventral segment; 102, male oval plate; 103, c. x. through oval plate showing ventral crest and raised lines; 104-105, right lateral and dorsal views of aedeagus and parameres.



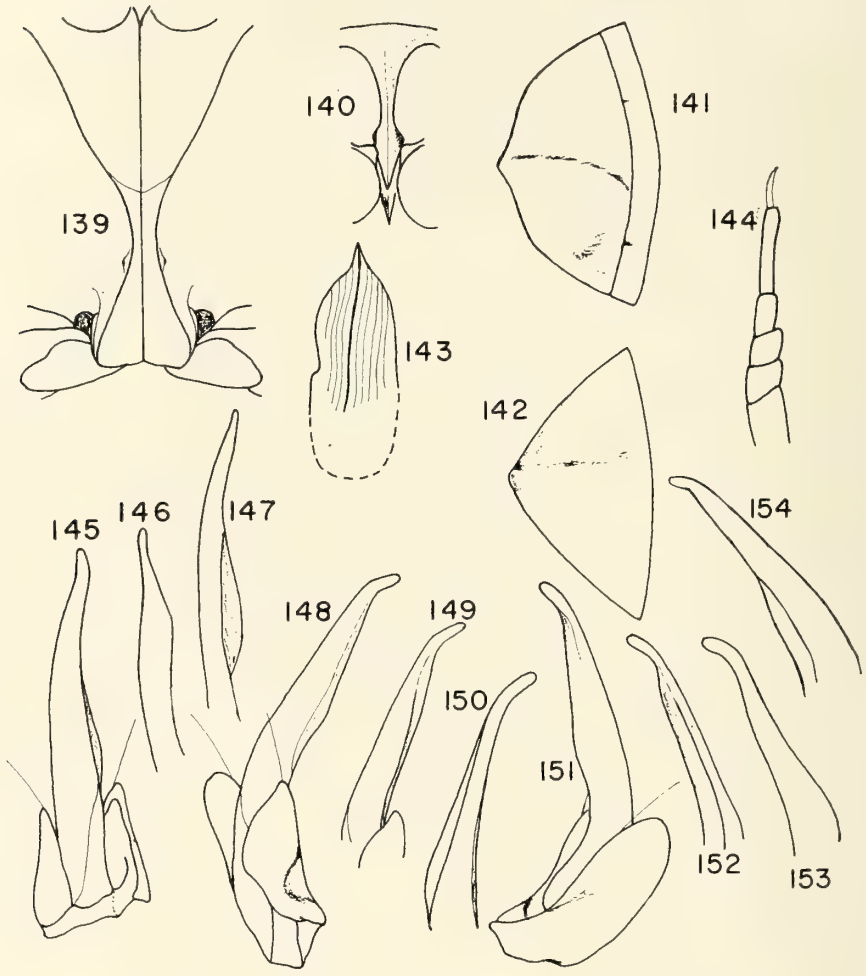
Figures 106-113. *Laccophilus fuscipennis*: 106, ventral view of metasternum, metacoxal file, and postcoxal processes; 107, prosternal process; 108, male last ventral segment; 109, female last ventral segment; 110, male oval plate, 111-113, right lateral, dorsal, and left lateral views of aedeagus and parameres.



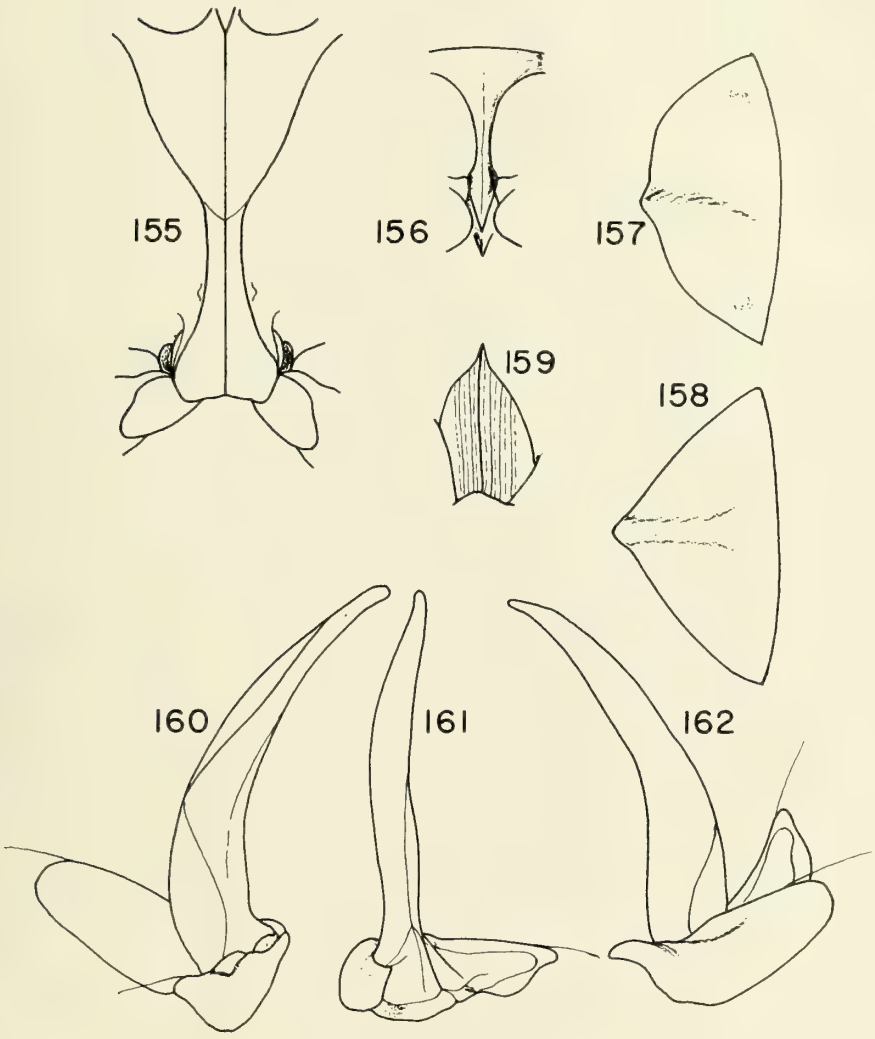
Figures 114-121. *Laccophilus youngi*: 114, ventral view of metasternum, metacoxal file, and postcoxal processes; 115, prosternal process; 116, male last ventral segment; 117, female last ventral segment; 118, male oval plate; 119-121, right lateral, dorsal, and left lateral views of aedeagus and parameres.



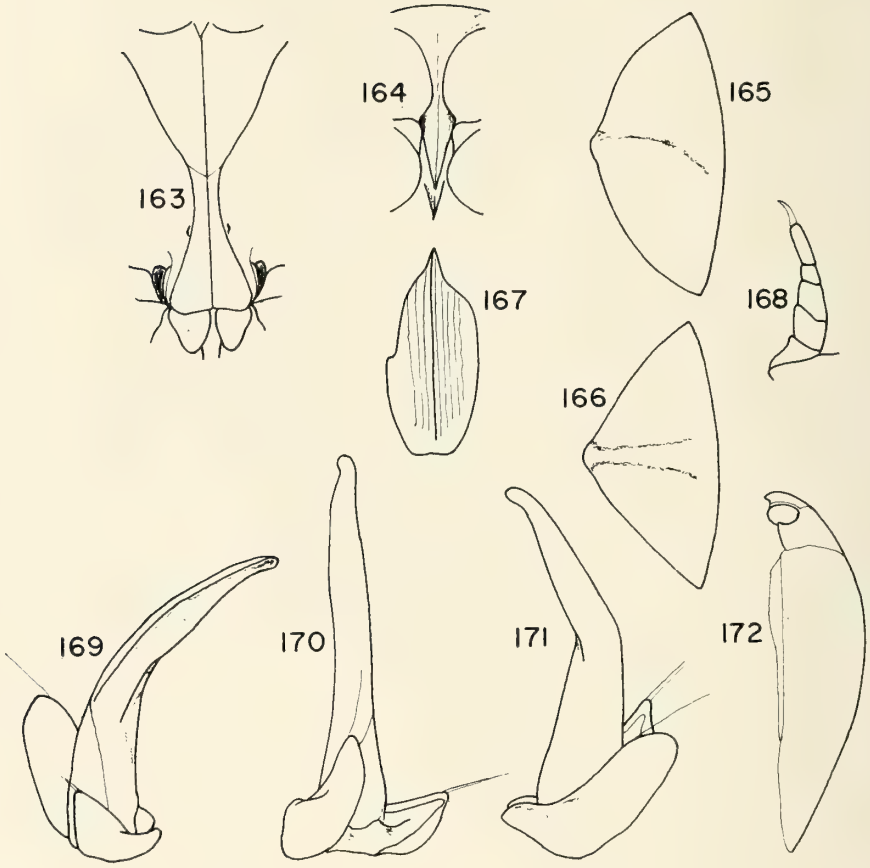
Figures 122-138. *Laccophilus pictus*: 122, ventral view of metasternum, metacoxal file, and postcoxal processes; 123, prosternal process; 124-125, male last ventral segments of *L. p. pictus* and *L. p. insignis*; 126, female last ventral segment; 127-128, male oval plates of *L. p. pictus* and *L. p. insignis;* 129-131, right lateral views of aedeagus and parameres of *L. p. coccinelloides* and aedeagi of *L. p. pictus* and *L. p. insignis*; 132-134, dorsal views of distal half of aedeagi of *L. p. coccinelloides, L. p. pictus,* and *L. p. insignis;* 135-138, left lateral views of aedeagi of *L. p. insignis, L. p. coccinelloides,* and intergrade of *L. p. pictus* and *L. p. coccinelloides,* and *L. p. pictus.*



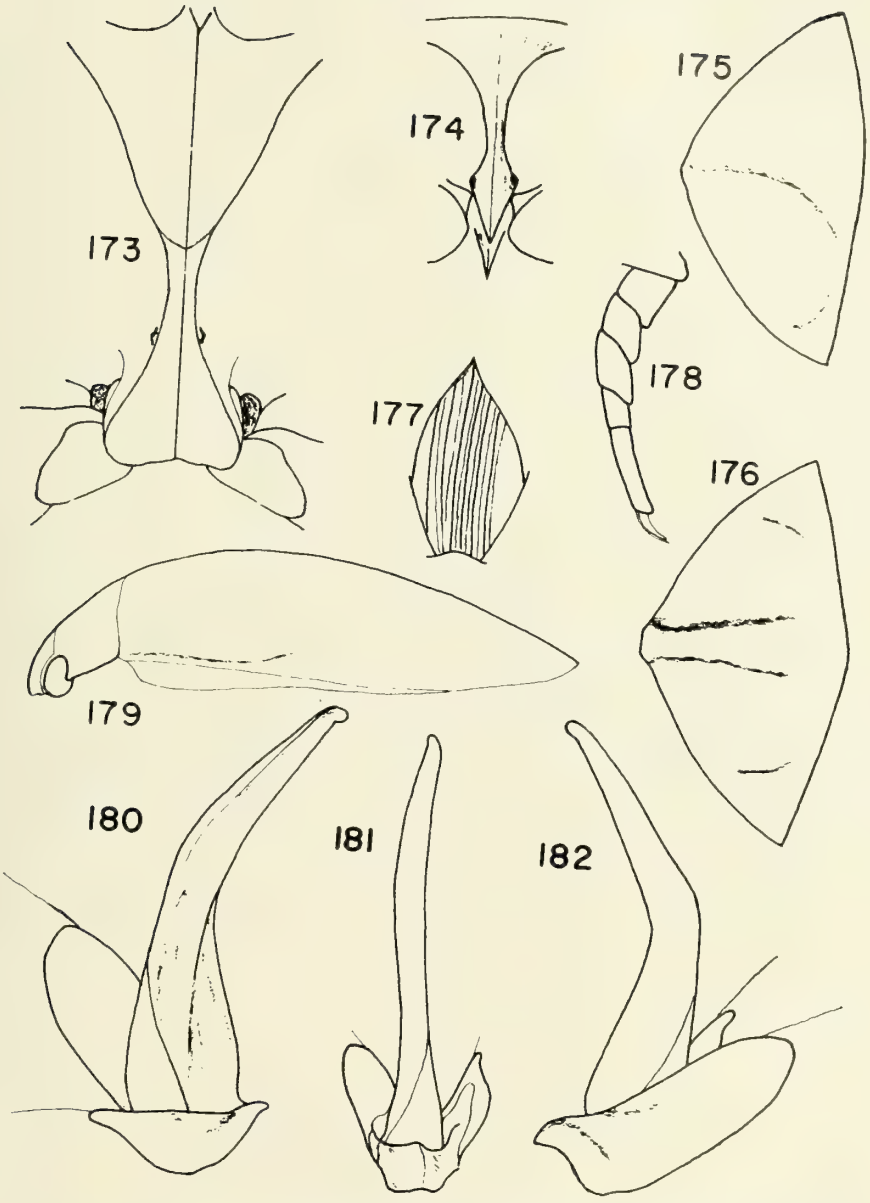
Figures 139-154. *Laccophilus vacaensis*: 139, ventral view of metasternum, and postcoxal processes; 140, prosternal processes; 141, last two ventral segments of male; 142, female last ventral segment; 143, male oval plate; 144, lateral view of male protarsus; 145-147, dorsal views of aedeagi and parameres of *L. v. vacaensis* from Kleberg Co., Texas, *L. v. chihuahuae,* and *L. v. vacaensis* from Progreso, Yucatan; 148-150, right lateral views of aedeagi and parameres of *L. v. vacaensis* from Kleberg Co., Texas, *L. v. chihuahuae,* and *L. v. vacaensis* from Progreso, Yucatan; 151-154, left lateral views of aedeagi and parameres of *L. v. vacaensis* from Kleberg Co., Texas, *L. v. chihuahuae,* and *L. v. vacaensis* from Progreso, Yucatan, and *L. v. thermophilus* from La Paz, Baja California.



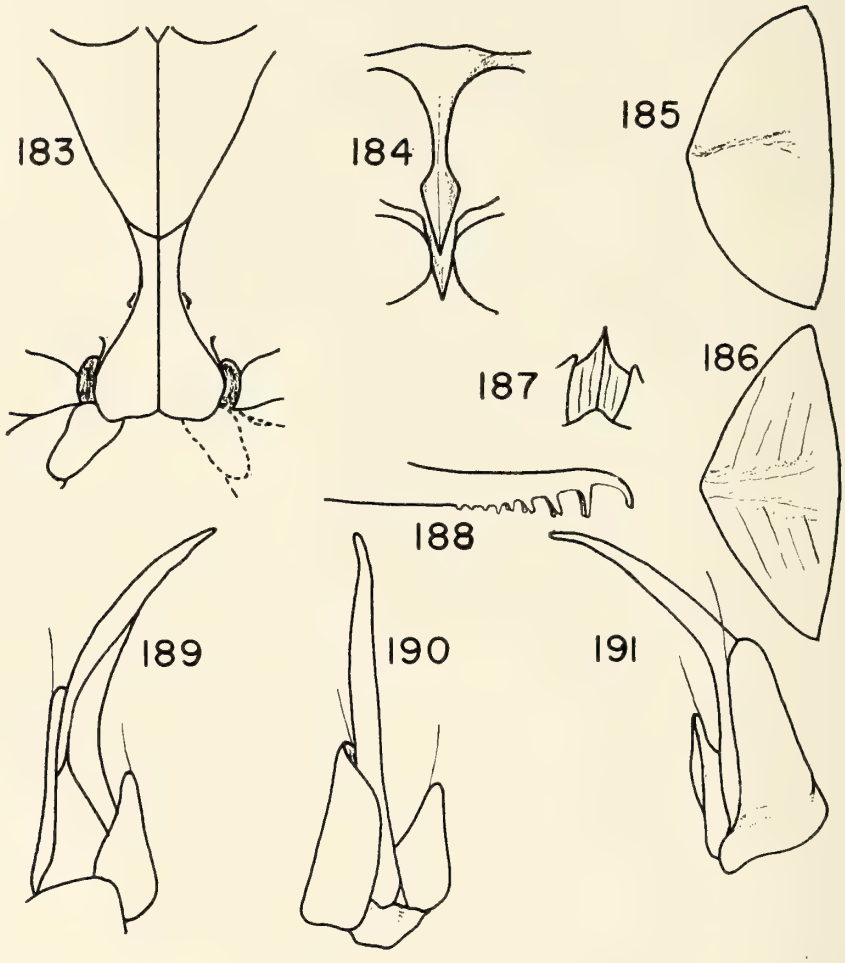
Figures 155-162. *Laccophilus spangleri*: 155, ventral view of metasternum and postcoxal processes; 156, prosternal process; 157, male last ventral segment; 158, female last ventral segment; 159, male oval plate; 160-162, right lateral, dorsal, and left lateral views of aedeagi and parameres.



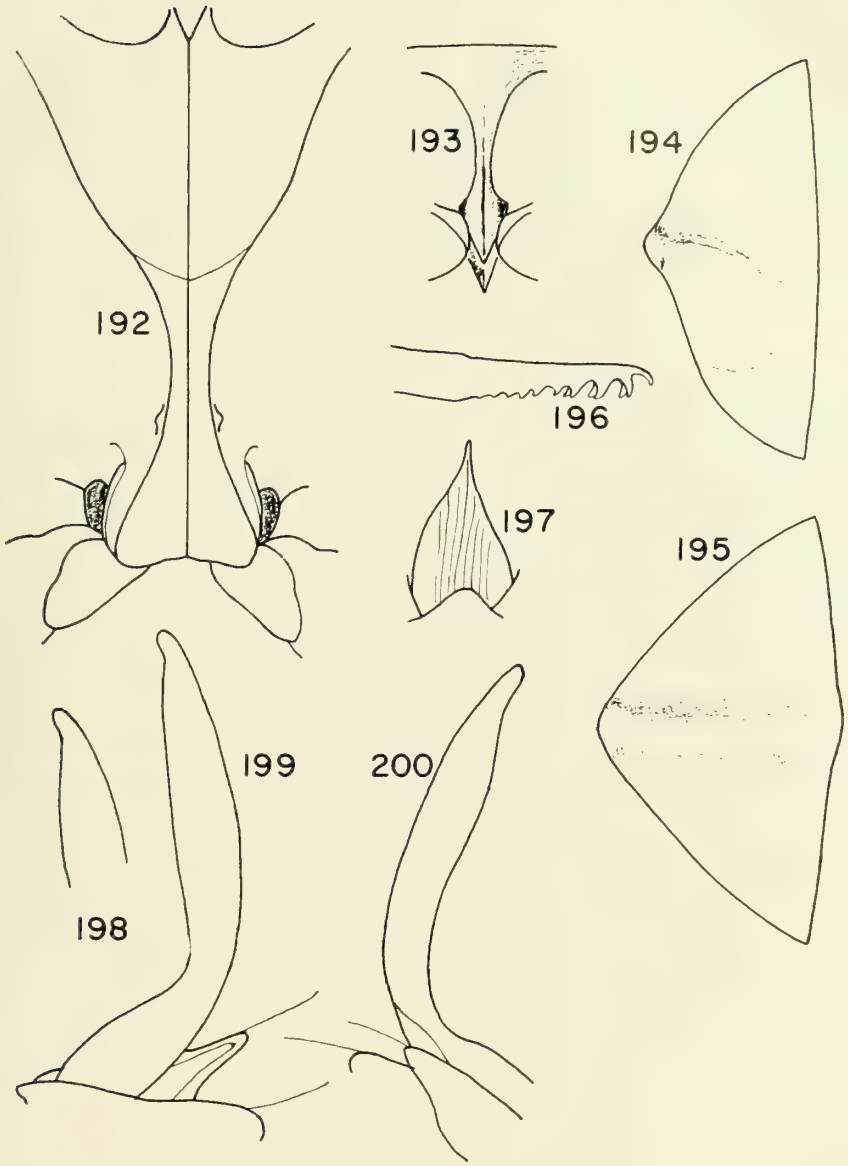
Figures 163-172. *Laccophilus peregrinus*: 163, ventral view of metasternum and postcoxal processes; 164, prosternal process; 165, male last ventral segment; 166, female last ventral segment; 167, male oval plate; 168, lateral view of male protarsus; 169-171, right lateral, dorsal, and left lateral view of aedeagus and parameres; 172, lateral view showing weak line above the epipleuron.



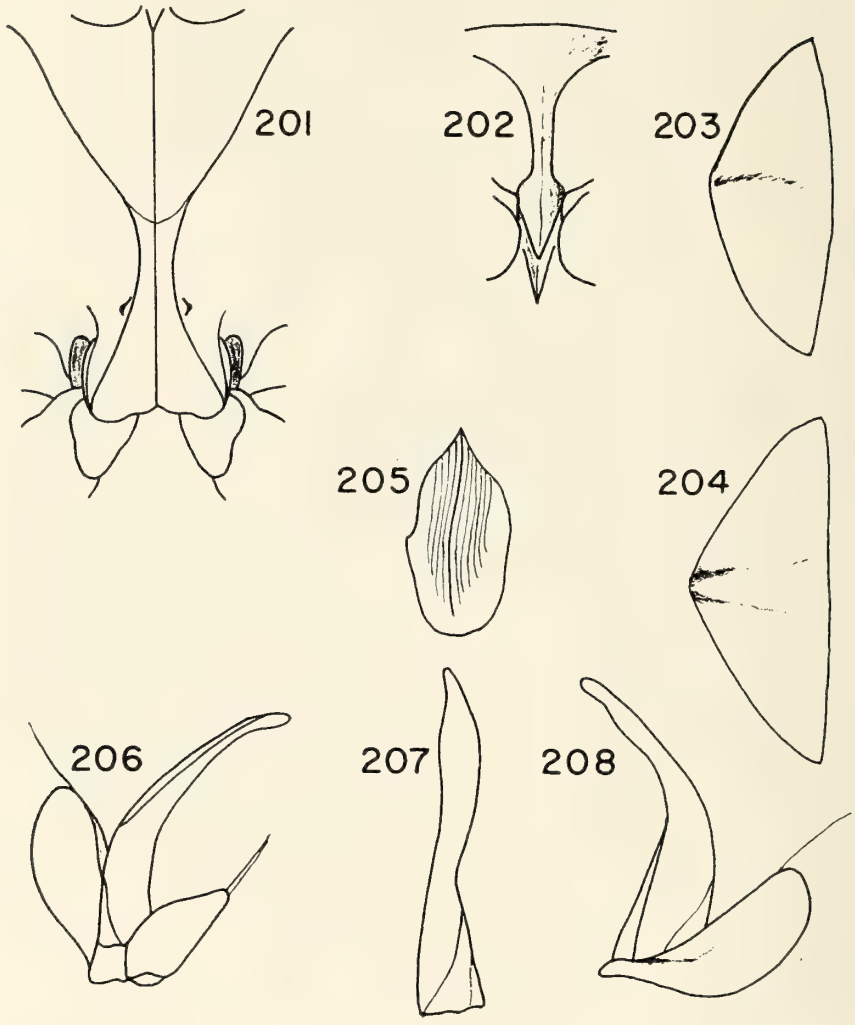
Figures 173-182. *Laccophilus raitti*: 173, ventral view of metasternum and postcoxal processes; 174, prosternal process; 175, male last ventral segment; 176, female last ventral segment; 177, male oval plate; 178, lateral view of male protarsus; 179, lateral view showing strong crease above the epipleuron; 180-182, right lateral, dorsal, and left lateral views of aedeagus and parameres.



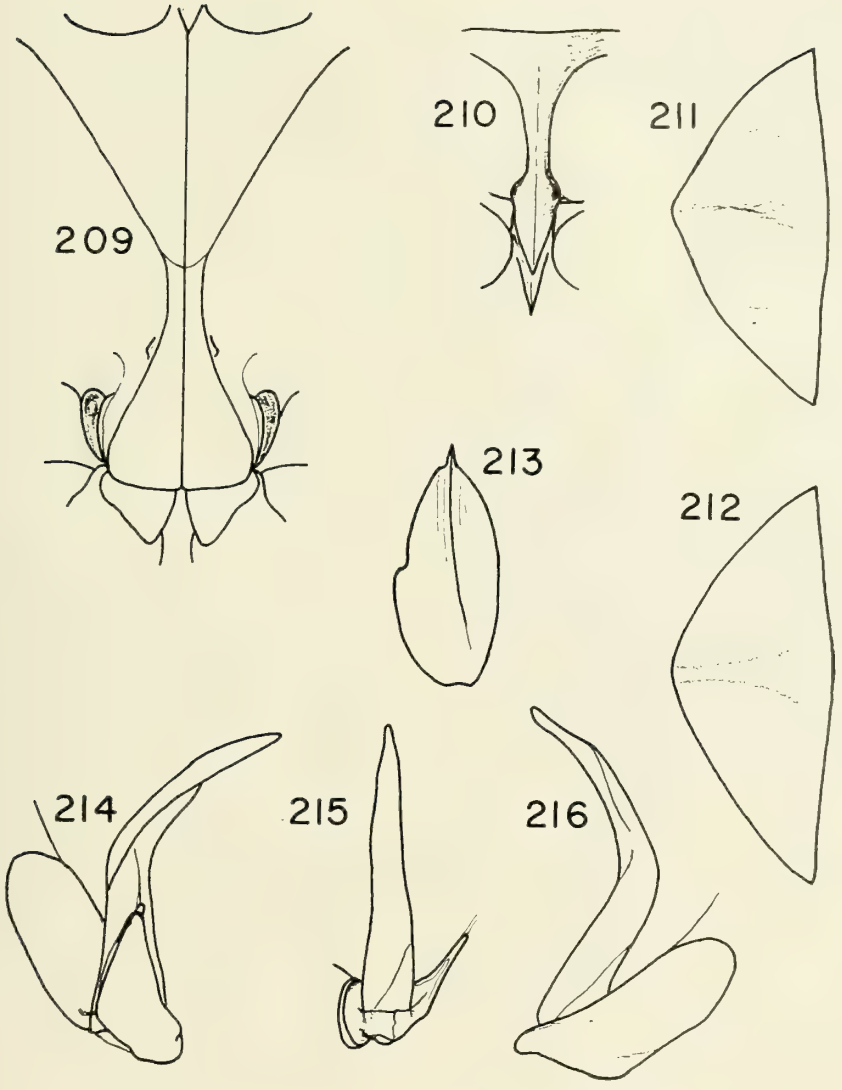
Figures 183-191. *Laccophilus huastecus*: 183, ventral view of metasternum and postcoxal processes; 184, prosternal process; 185, male last ventral segment; 186, female last ventral segment; 187, distal part of male oval plate; 188, ovipositor; 189-191, right lateral, dorsal, and left lateral views of aedeagus and parameres.



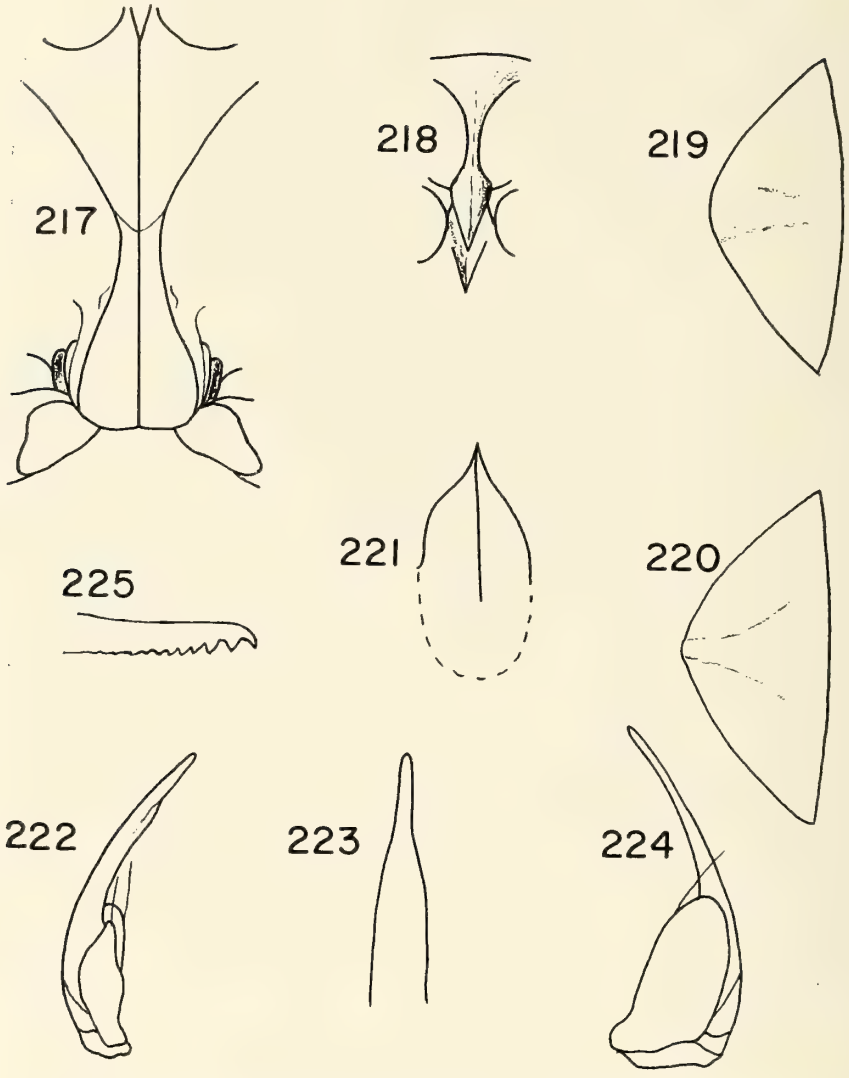
Figures 192-200. Figs. 192-198. *Laccophilus quadrilineatus*: 192, ventral view of metasternum and postcoxal processes; 193, prosternal process; 194, male last ventral segment; 195, female last ventral segment; 196, ovipositor; 197, distal half of male oval plate; 198, left lateral view of the distal third of aedeagus. Figs. 199-200. *Laccophilus sonorensis*: left and right lateral views of aedeagus and parameres.



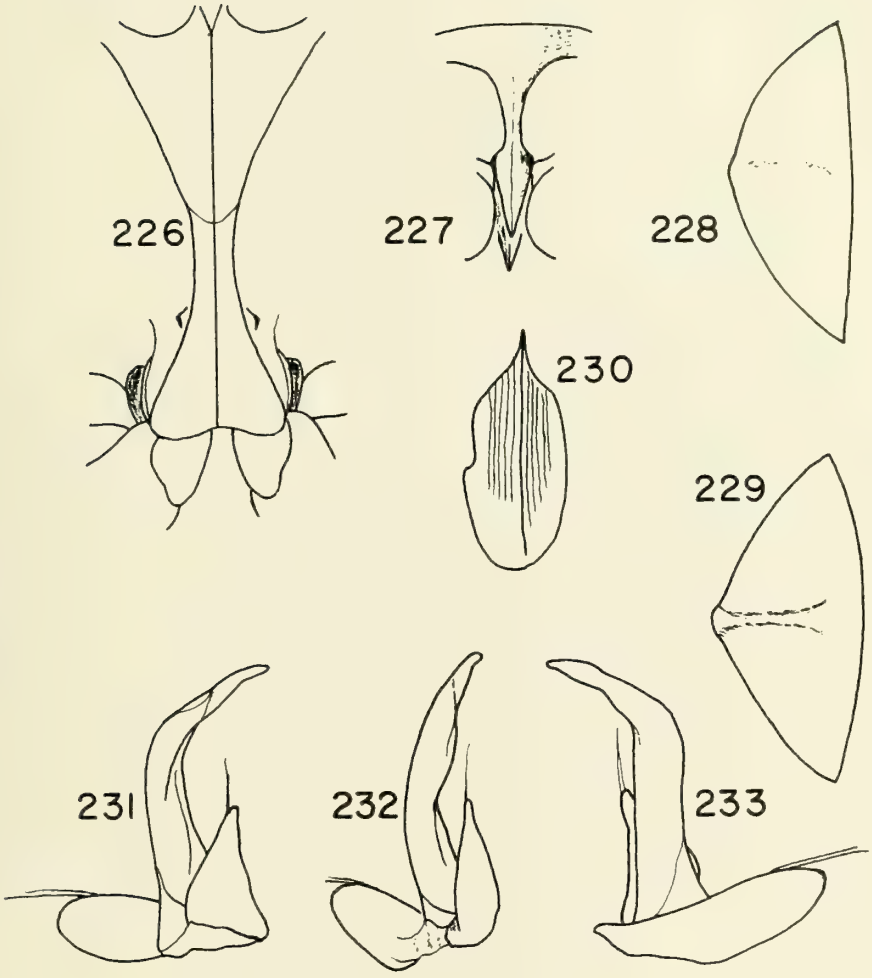
Figures 201-208. *Laccophilus biguttatus*: 201, ventral view of metasternum and postcoxal processes; 202, prosternal process; 203, male last ventral segment; 204, female last ventral segment; 205, male oval plate; 206-208, right lateral, dorsal, and left lateral views of aedeagus and parameres.



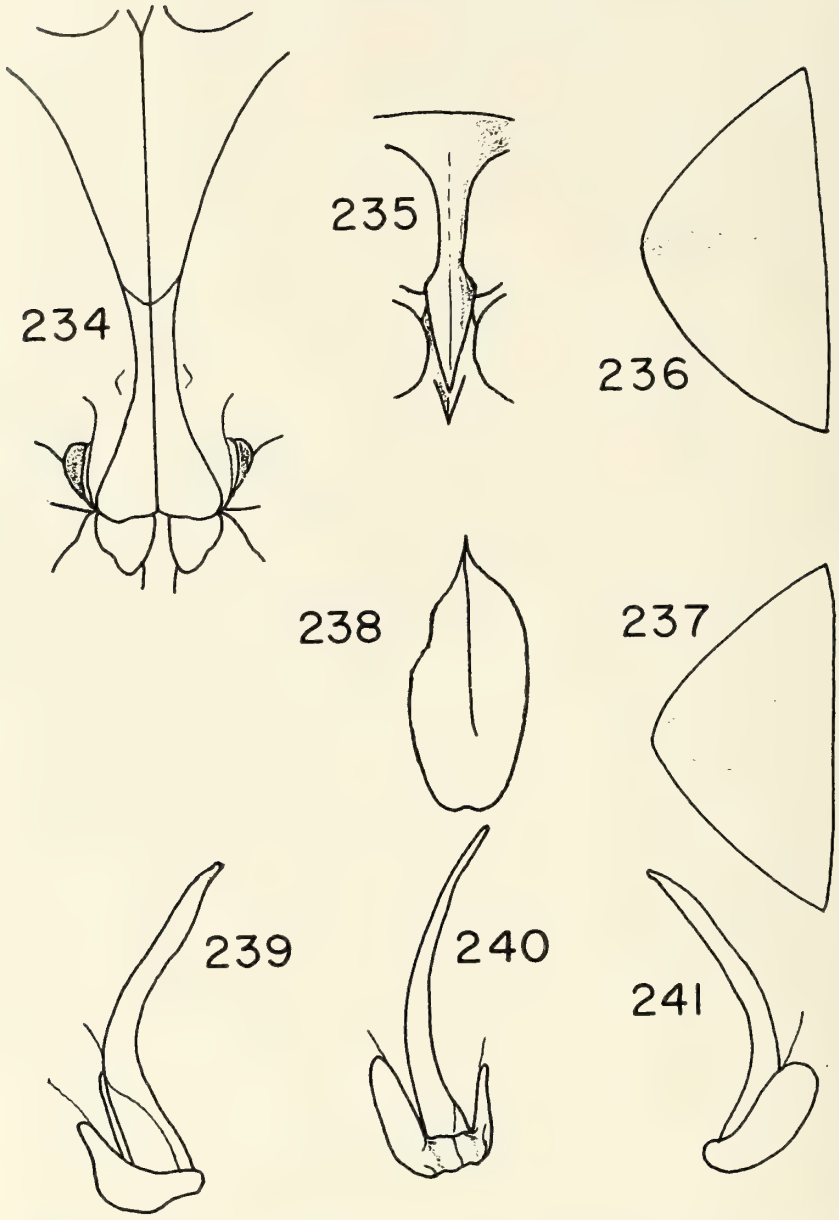
Figures 209-216. *Laccophilus horni*: 209, ventral view of metasternum and postcoxal processes; 210, prosternal process; 211, male last ventral segment; 212, female last ventral segment; 213, male oval plate; 214-216, right lateral, dorsal, and left lateral views of aedeagus and parameres.



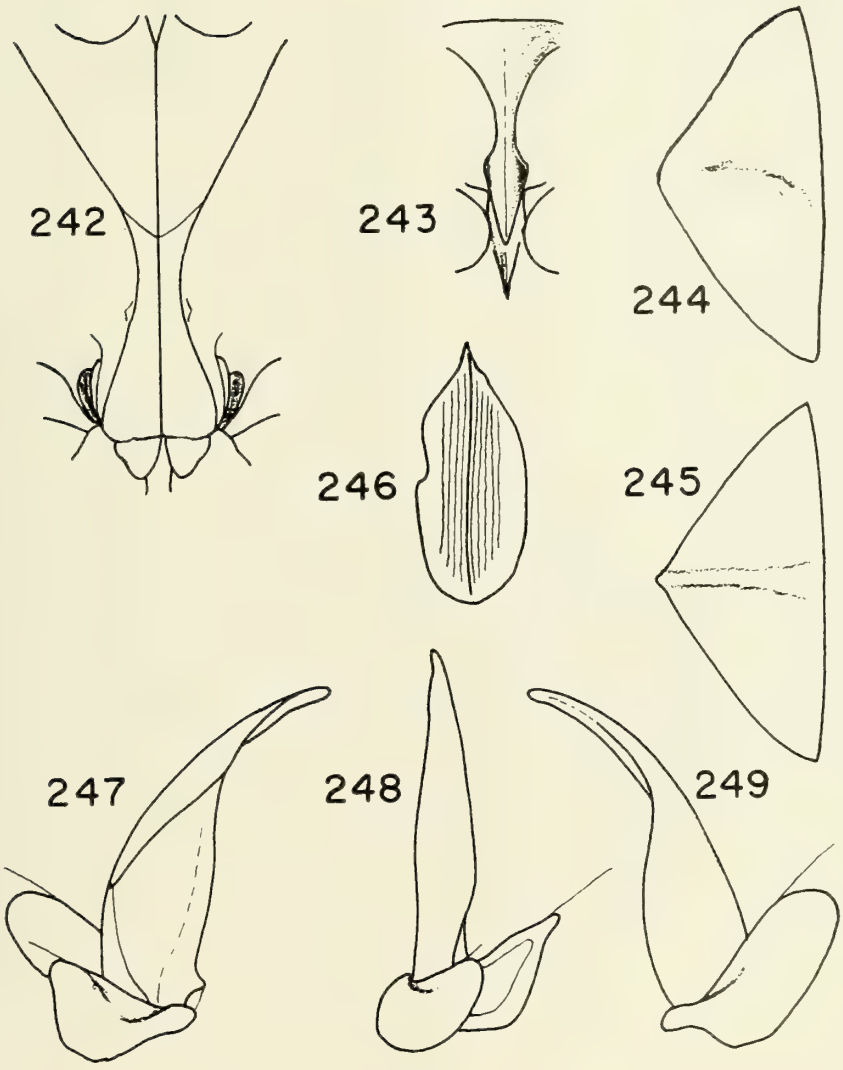
Figures 217-225. *Laccophilus leechi*: 217, ventral view of metasternum and postcoxal processes; 218, prosternal process; 219, male last ventral segment; 220, female last ventral segment; 221, male oval plate; 222-224, right lateral, dorsal, left lateral views of aedeagus and parameres; 225, ovipositor.



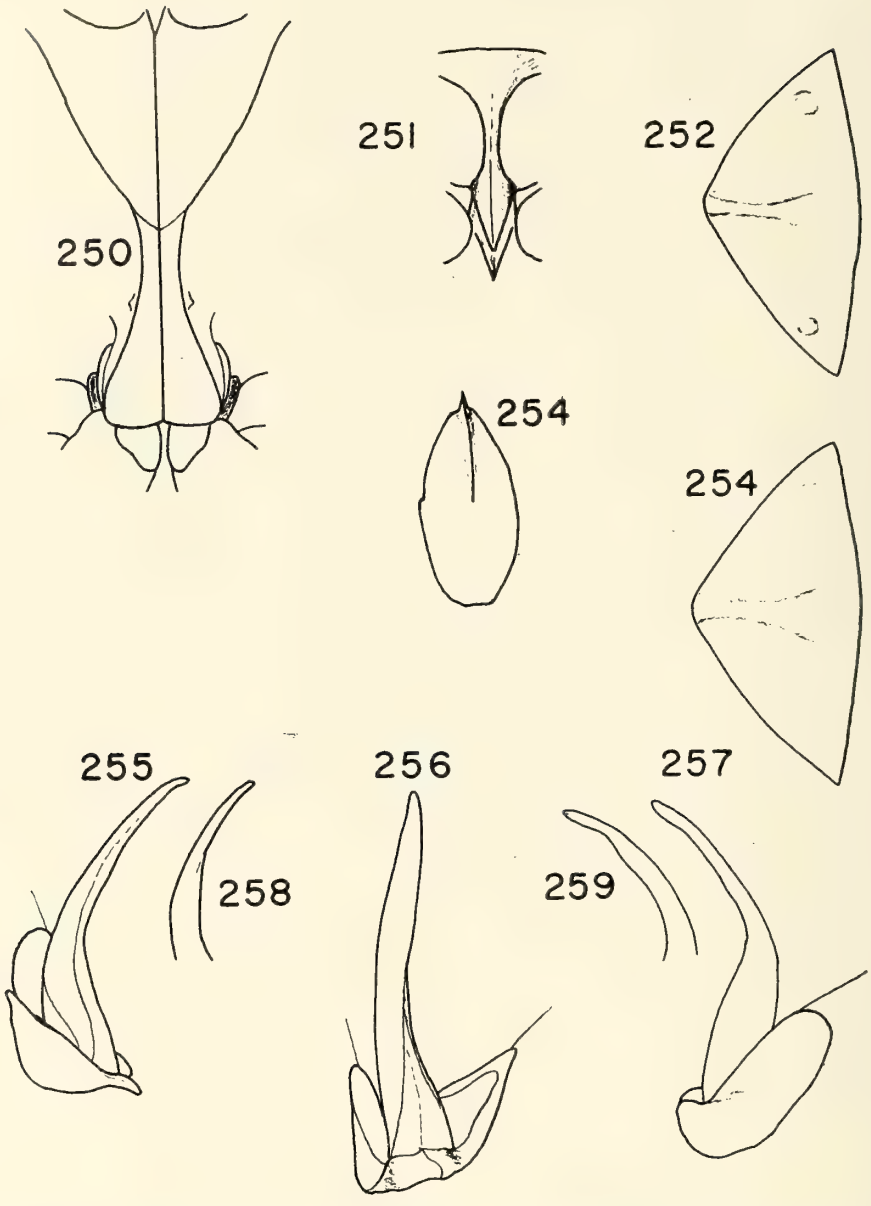
Figures 226-233. *Laccophilus undatus*: 226, ventral view of metasternum and postcoxal processes; 217, prosternal process; 228, male last ventral segment; 229, female last ventral segment; 230, male oval plate; 231-233, right lateral, dorsal, and left lateral views of aedeagus and parameres.



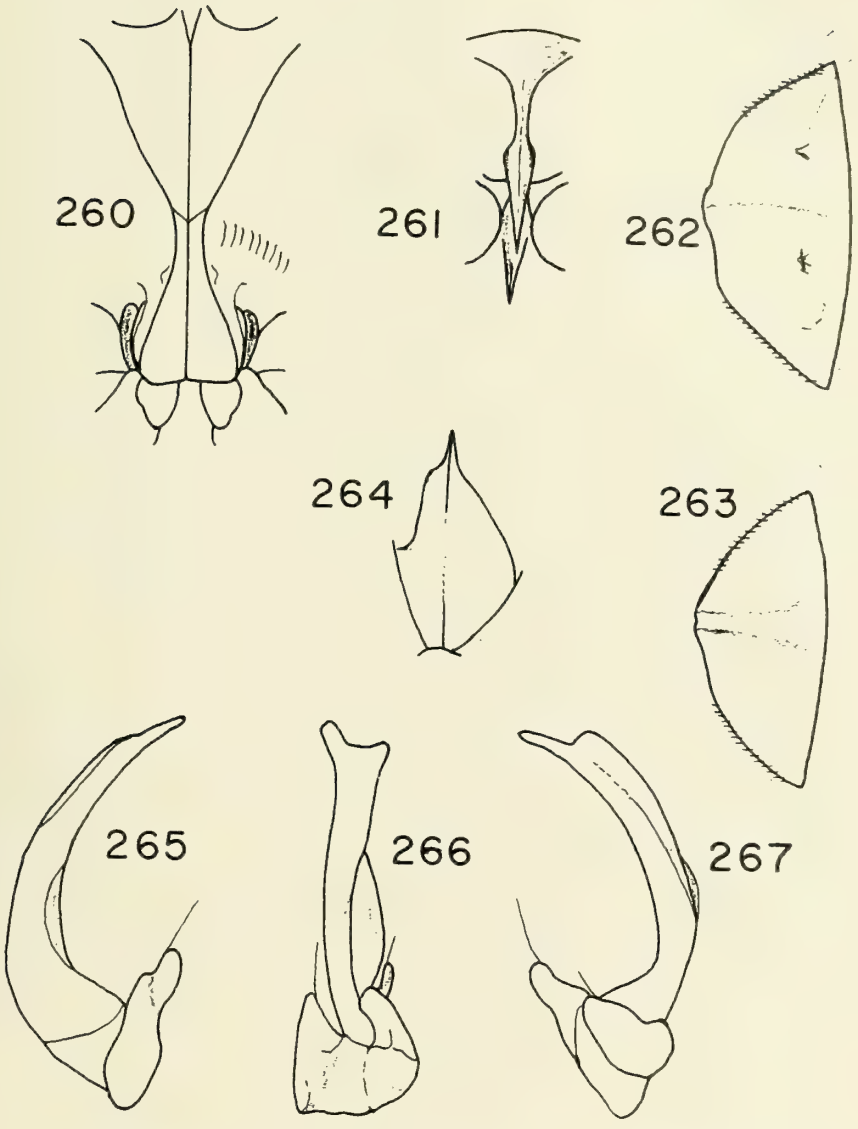
Figures 234-241. *Laccophilus schwarzi*: 234, ventral view of metasternum and postcoxal processes; 235, prosternal process; 236, male last ventral segment; 237, female last ventral segment; 238, oval plate; 239-241, right lateral, dorsal, and left lateral views of aedeagus and parameres.



Figures 242-249. *Laccophilus duplex*: 242, ventral view of metasternum and postcoxal processes; 243, prosternal process; 244, male last ventral segment; 245, female last ventral segment; 246, male oval plate; 247-249, right lateral, dorsal, and left lateral views of aedeagus and parameres.



Figures 250-259. *Laccophilus oscillator*: 250, ventral view of metasternum and postcoxal processes; 251, prosternal process; 252, male last ventral segment; 253, female last ventral segment; 254, male oval plate; 255-257, right lateral, dorsal, and left lateral views of aedeagus and parameres of *L. o. oscillator*; 258-259, right and left lateral views of the distal half of aedeagus of *L. o. laevipennis*.



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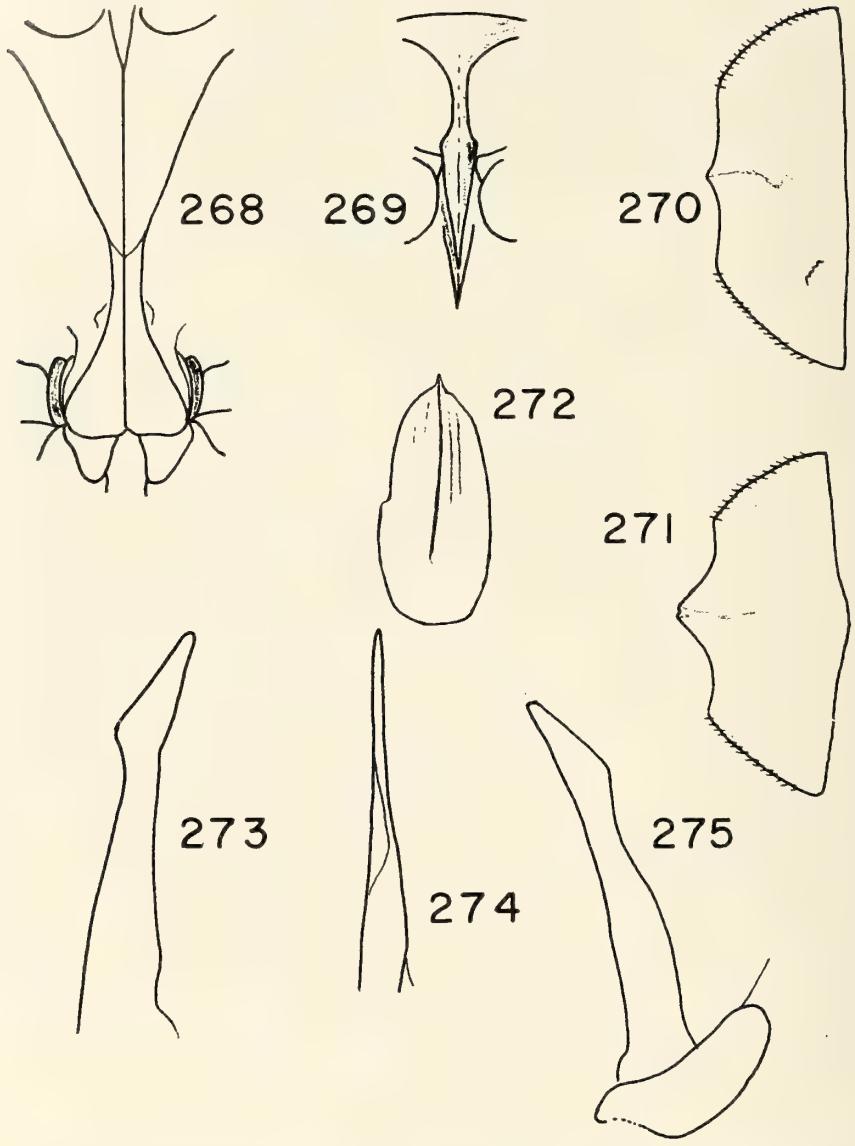

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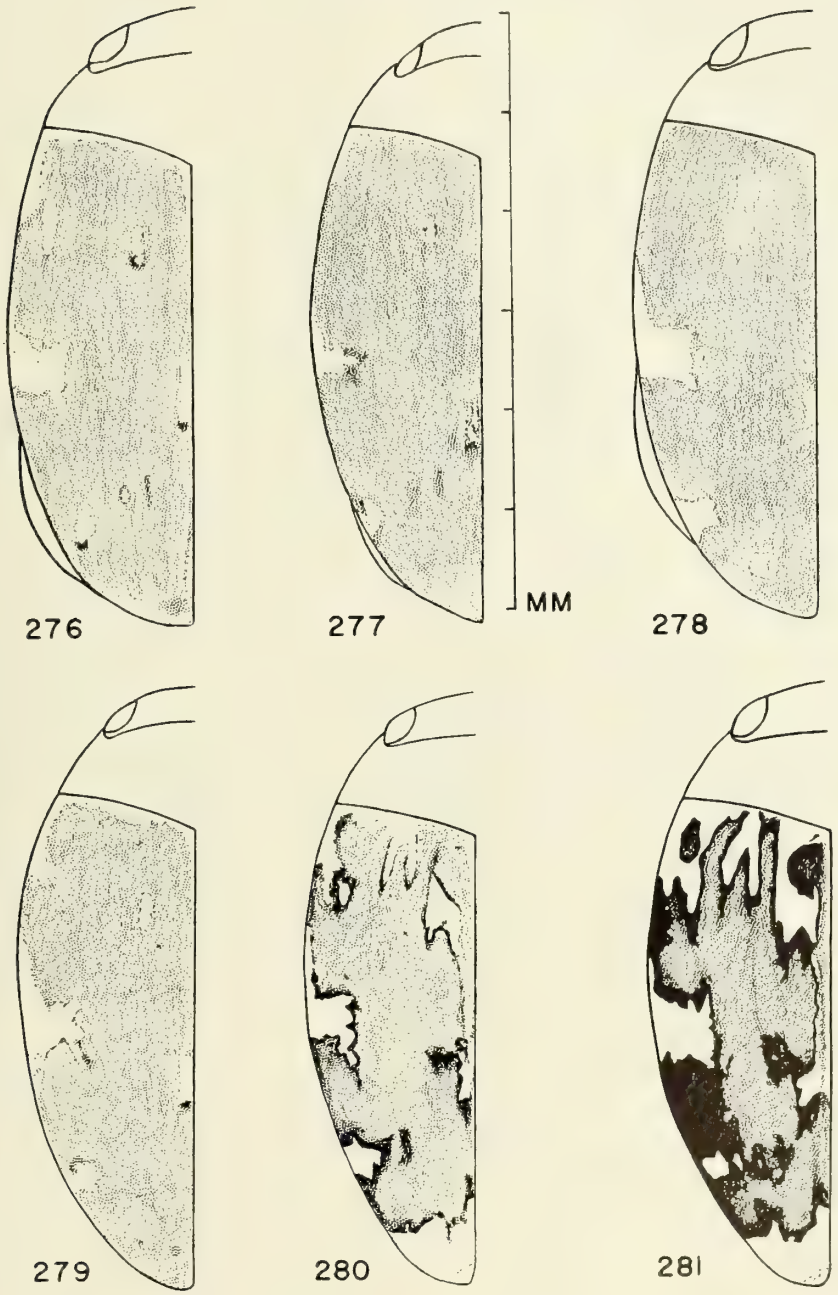

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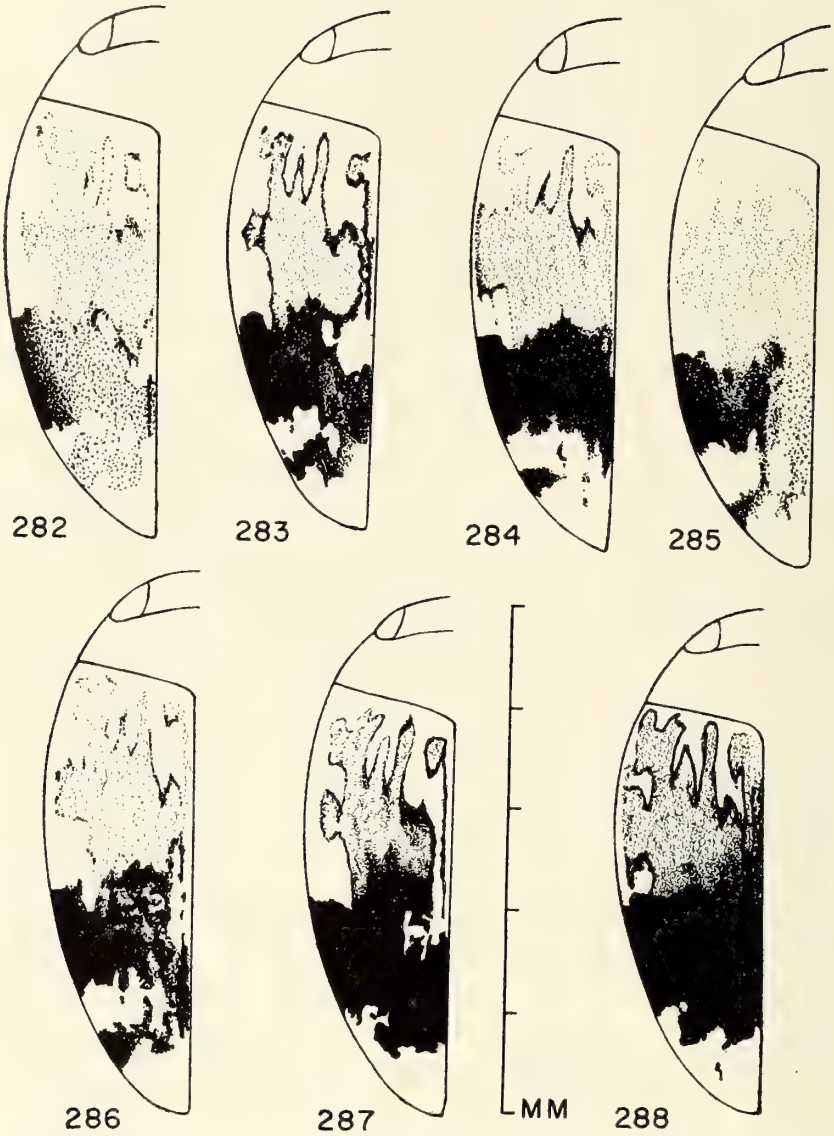

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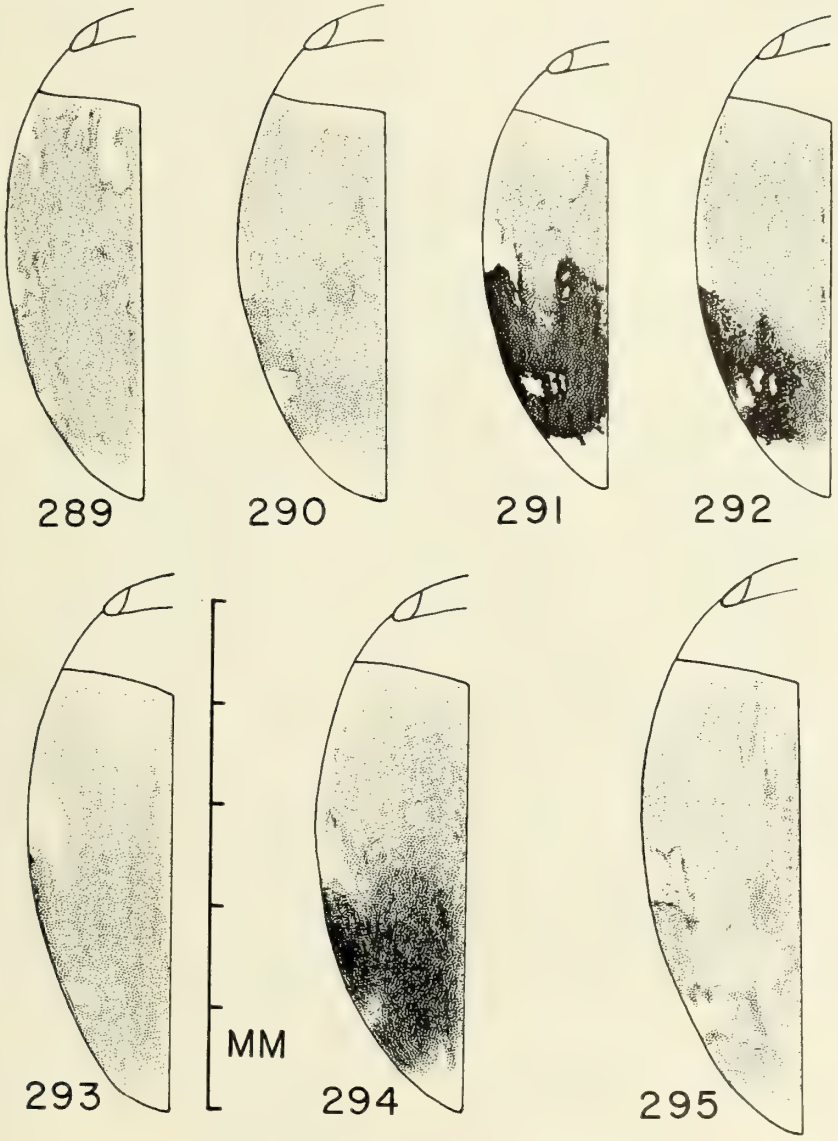

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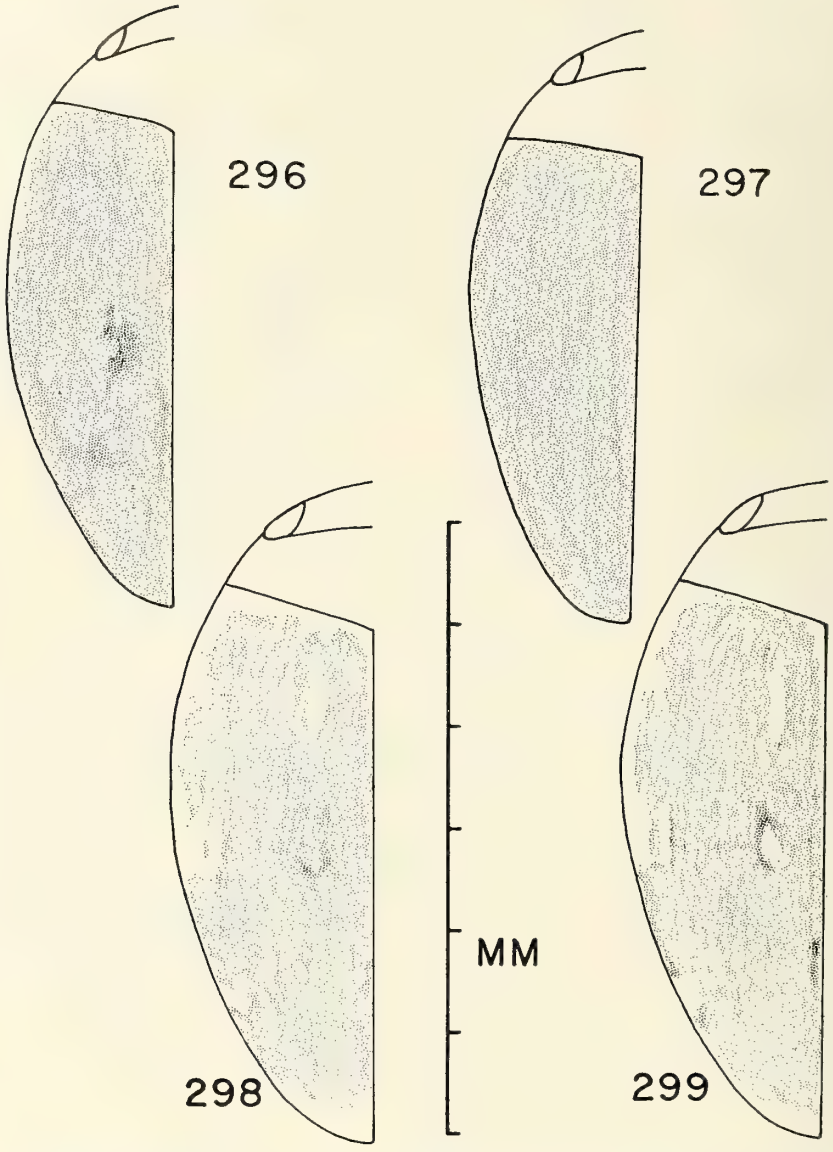

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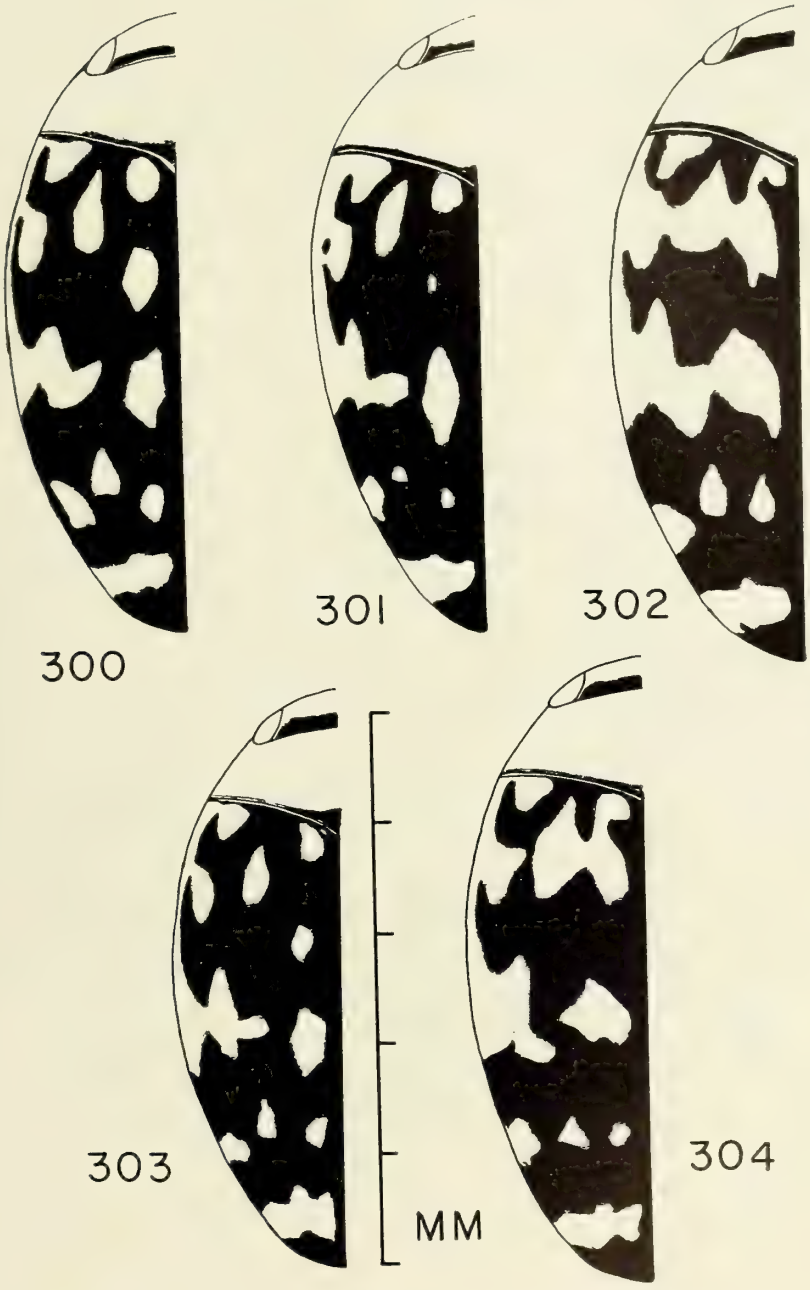

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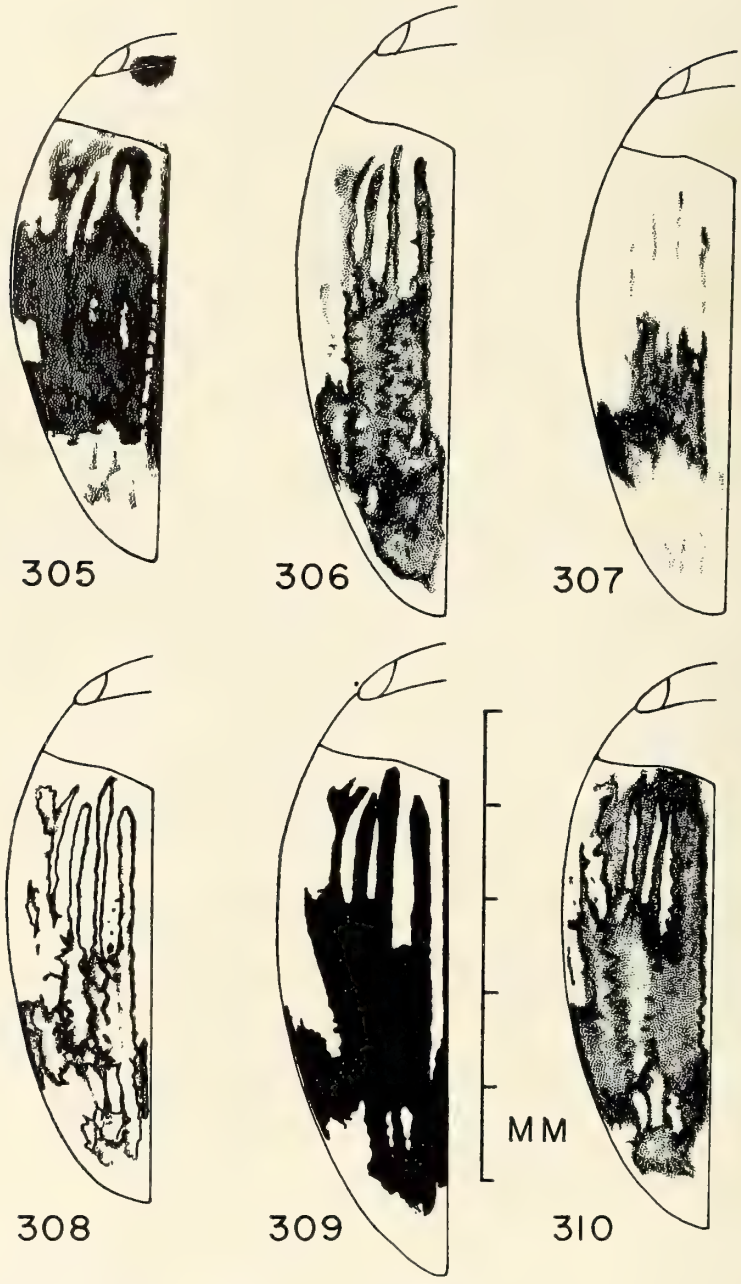

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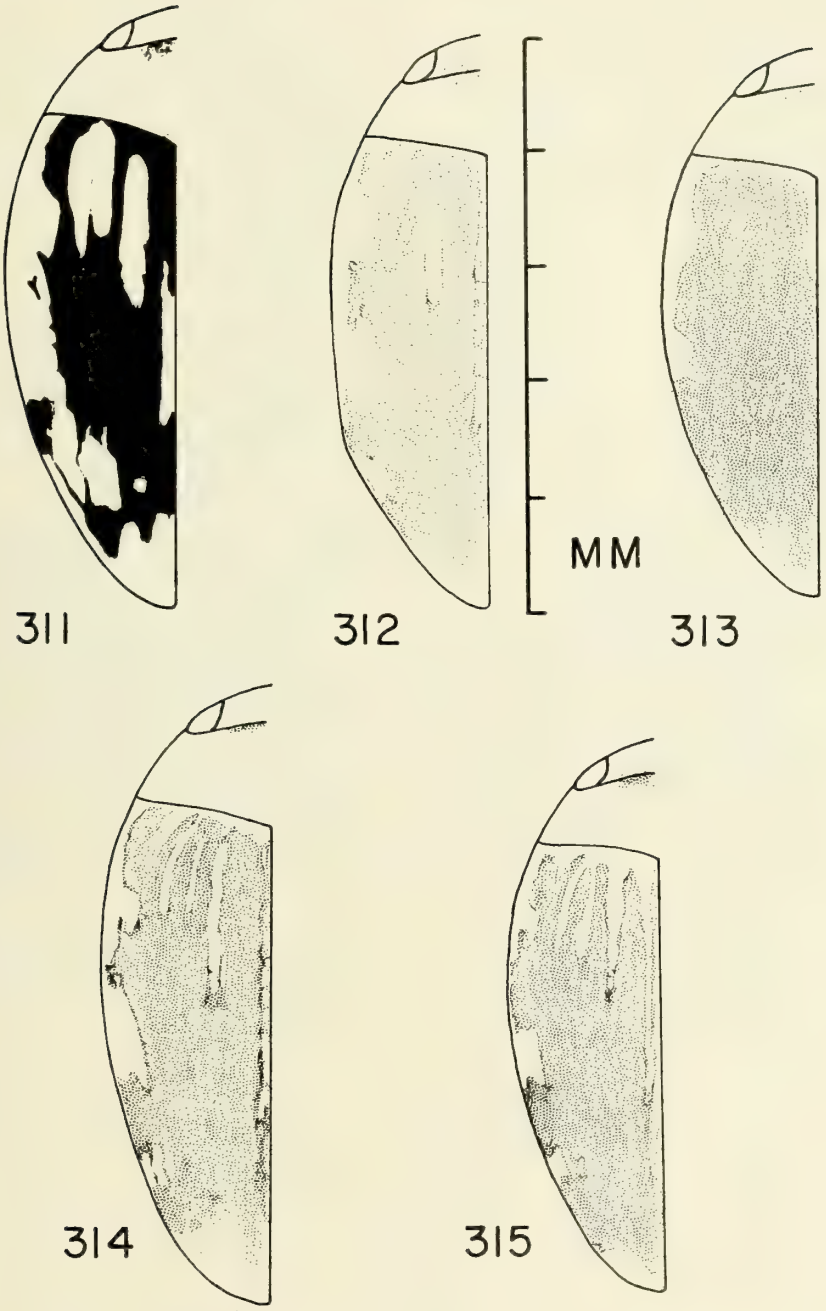

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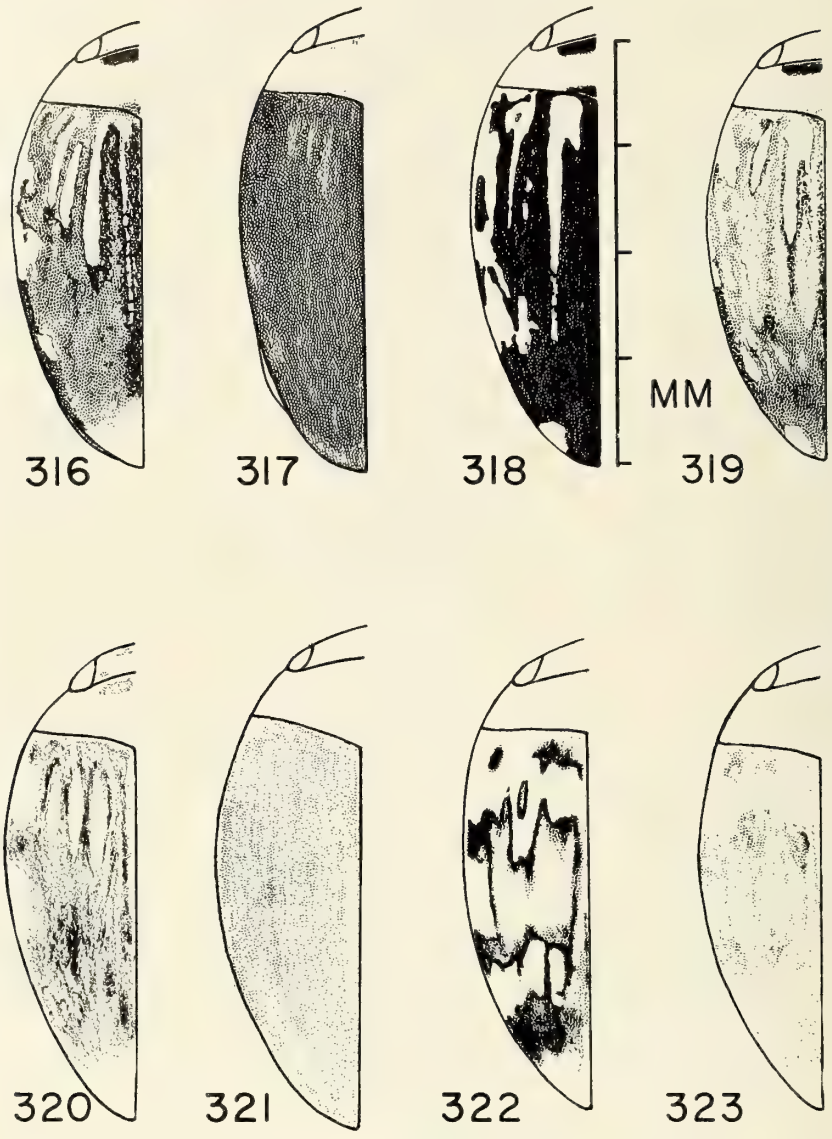

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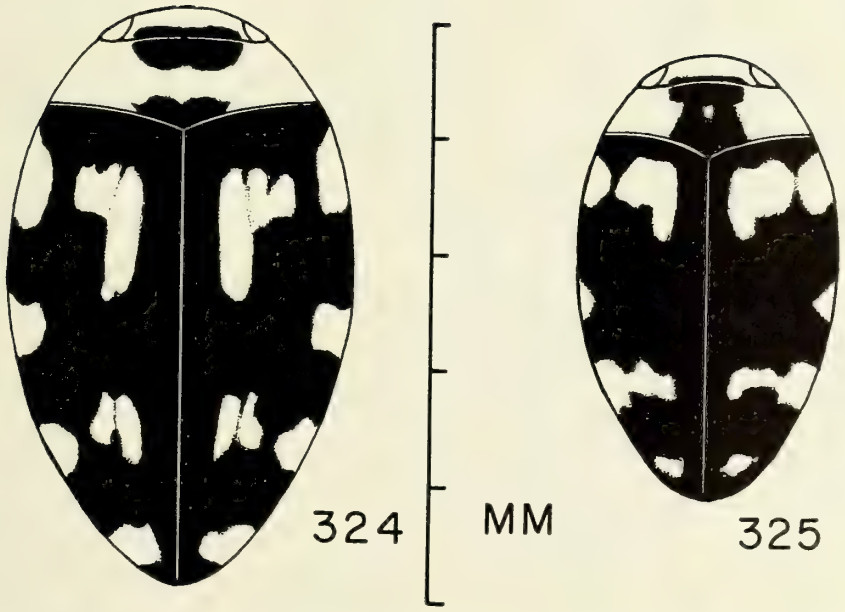

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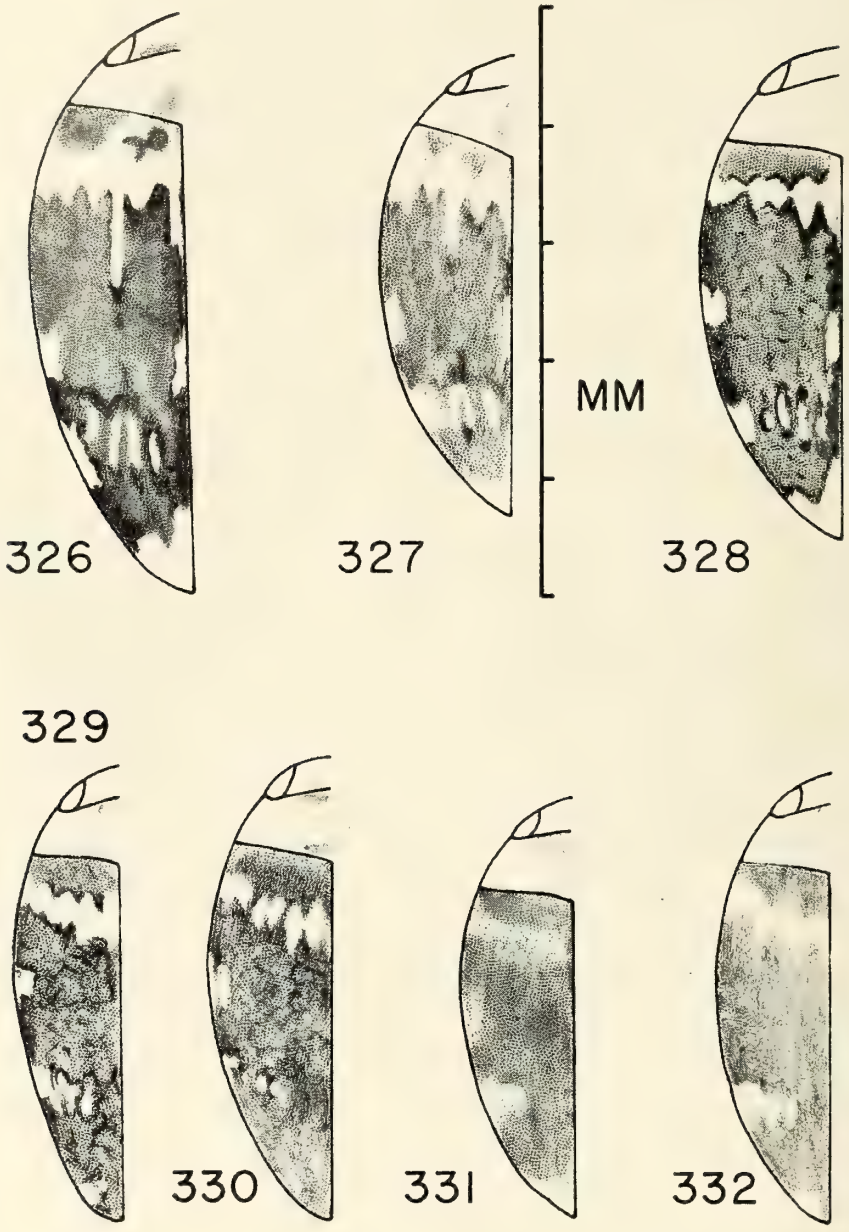

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